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DEVELOPING AN ELECTRONIC BENEFIT TRANSFER SYSTEM
FOR THE FOOD STAMP PROGRAM

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EXECUTIVE SUMMARY

In July of 1983 the United States Department of Agriculture, Food and Nutrition Service (FNS) awarded a contract to the Planning Research Corporation to demonstrate a mechanism for providing Food Stamp Program benefits through electronic funds transfer and point-of-sale technologies. In October 1984, an electronic benefit transfer (EBT) system using these technologies began operations in Reading, Pennsylvania. Demonstration recipients were gradually phased onto the new issuance system over a four-month start-up period, and the Reading EBT system was fully operational in February 1985.

This report describes the Reading EBT system and documents the activities undertaken during its design and development, and during the first five months of its implementation. The intent is to provide early information about the system to a variety of interested parties: members of Congress, Food Stamp Program authorities, federal agencies, and others interested in EBT systems in general and the Reading demonstration in particular.

The report does not evaluate the Reading EBT system. After the demonstration is completed (at the end of 1985) an evaluation report will be prepared. That report will evaluate the impacts of the Reading EBT system on agency operations, on food stamp recipients, on retailers, and on financial institutions.

Federal and State Interest in Alternatives to the Coupon System for the Issuance of Food Stamp Benefits Resulted in the Reading EBT Demonstration

The Food Stamp Program currently provides benefits in the form of food stamp coupons. State agencies use various systems to deliver these coupons. Some states mail coupons directly to recipients. A few states use on-line computer systems to verify recipients' authorization to receive benefits before delivering coupons directly to recipients at a local issuance point. Most states, however, mail monthly Authorization-to-Participate (ATP) cards to recipients. Recipients take the ATPs to local issuance offices to obtain their coupons. The level of automation in preparing and mailing these ATPs varies among states.

The delivery and control of ATPs and food stamp coupons is costly and difficult to administer. In addition, these issuance systems are vulnerable to administrative error and to certain types of fraud and abuse. Where ATPs or coupons are mailed to recipients, mail theft may occur or be falsely reported by recipients. Trafficking--the illegal sale of food stamp coupons for cash--occurs. In addition, instances of ATP and coupon theft by program employees and postal service employees have been reported.

In response to these problems, federal and state food stamp authorities have been seeking less costly and more secure ways to provide food stamp benefits. In May 1981, FNS announced its intent to sponsor demonstration projects to develop and test alternative issuance systems. State and local agencies were invited to submit proposals indicating their interest and describing their proposed system.

Shortly thereafter, as part of USDA's efforts to explore alternative issuance systems, FNS commissioned a feasibility study. The study assessed the technological, economic, and programmatic feasibility of using electronic technologies to transfer program benefits. The solicitation to state and local agencies for proposed demonstrations of alternative issuance systems was suspended in November 1981, pending the outcome of the feasibility study.

Released in March 1982, the study concluded that a food stamp EBT system would be technically and economically feasible. It recommended that FNS sponsor a demonstration to determine the programmatic feasibility of implementing such a system, pointing out that retailer acceptance would be a key to successful implementation.

As a result of the feasibility study, FNS changed its research strategy. The original solicitation to state and local agencies was cancelled in May 1982. FNS issued a new solicitation the following January inviting proposals from independent contractors to design, develop, and implement alternative issuance systems employing electronic funds transfer and point-of-sale technologies. Contractors were required to obtain commitments from state and local food stamp authorities that they would cooperate in the demonstration. A contract was awarded in July 1983 to Planning Research Corporation (PRC) to demonstrate an EBT system in Reading.

The Reading EBT Demonstration Replaces Food Stamp Coupons with Benefit Cards and an On-line Computer System

The Reading EBT system consists of an on-line computer network connecting a local computer center with Benefit Transaction Terminals (BTTs) in approximately 145 retail food outlets in and around Reading. Approximately 3,600 food stamp recipients in Reading received benefit cards from the local welfare office. Recipients may use their cards at any participating retail outlet to purchase groceries.

Each participating recipient and retailer has a computerized account at the EBT Center (the local operations center for the system). Recipients' accounts are credited each month with their authorized benefit amounts when the Pennsylvania Department of Public Welfare (PDPW) transmits issuance data to the EBT Center. When recipients purchase groceries, their EBT accounts are immediately debited and retailers' accounts are credited through electronic transmission of purchase data from the stores' BTTs to the EBT Center. After the end of every banking day, which runs from 2:00 PM to 2:00 PM, each store's credits for the day are totaled at the EBT Center and delivered to the staff of American Bank & Trust Company (AB&T). The bank is located in Reading and provides space to the EBT Center.

Acting as a clearinghouse bank for the system, AB&T enters the retailers' credit information into the Automated Clearing House (ACH) network the same evening. These electronic funds transfer requests pass through the Federal Reserve banking system, culminating in a drawdown against a USDA letter-of-credit account at the United States Treasury. Retailers' credits are deposited into accounts at their banks the following morning.

To purchase groceries at participating retail food outlets, recipients present their benefit card to the store clerk at the checkout counter. A magnetic stripe on the card contains the following encoded data: card number, a code called the PIN offset which is based on the card number and the recipients' four-digit Personnel Identification Number (PIN), and a check-sum digit which is based on the card number and the PIN offset. The clerk passes the card through a card reader attached to the BTT. The BTT confirms that the encoded information on the card has been read correctly by computing a new check-sum digit and comparing it to the encoded digit. The recipient then

enters his or her PIN on an attached PIN-pad, and the BTT verifies that the
PIN is correct by computing a new PIN offset and comparing it to the PIN
offset encoded on the card. After the PIN is verified, the clerk enters the
purchase total on the BTT and presses a "Send" key on the BTT.

The BTT automatically dials the EBT Center and transmits the purchase
transaction data. The computer at the EBT Center verifies that a valid
account exists for the recipient and checks the remaining balance in the
recipient's account. If the account has sufficient funds to cover the inten-
ded purchase, the transaction is processed; the recipient's account is debited
and the store's account is credited by the purchase amount. A two-part re-
ceipt showing the purchase total and the recipient's remaining balance (after
the purchase) is printed at the checkout counter. The recipient keeps one
copy of the receipt and the store retains the other copy for its records.

If the recipient's account has insufficient funds to cover the pur-
chase, the EBT Center relays this information back to the BTT. The recipient
may either return some items or pay for some of the groceries with cash. A
second EBT transaction must be processed for the new purchase amount.

Recipients can keep track of their food stamp balance through the
remaining balance information provided on each purchase receipt. In addition,
they may use any BTT or any touch-tone telephone to call the EBT Center for
balance information. The recipient's PIN must be entered to obtain the cur-
rent balance. When using a telephone, the recipient also must enter his or
her case number (which is printed on the benefit card).

If the recipient has difficulty remembering his or her PIN for a
balance inquiry or purchase, the BTT will allow three attempts to enter the
correct PIN. After three unsuccessful PIN entry attempts, the BTT automatic-
ally dials the EBT Center and transmits an unsuccessful PIN entry message.
The recipient may attempt another transaction or balance inquiry immediately
at a different BTT, or at the same BTT after it has processed a transaction
for a different food stamp client. If the EBT Center receives three unsuc-
cessful PIN entry messages (indicating nine unsuccessful attempts to enter the
correct PIN) during a single day, the system will not accept further attempts

to obtain balance information for that account until the next day. This limi-
tation is designed to prevent unauthorized persons from discovering PINs
through trial and error. The limit does not apply to purchases, however. A
recipient can make a purchase at any time he or she enters the correct PIN.

Finally, food stamp purchases can be processed manually if a malfunc-
tion causes the system to be inaccessible to EBT transactions. The store
clerk calls an EBT Center operator, who verifies that the recipient's balance
will cover the purchase and then authorizes the transaction. The maximum
allowable manual transaction is $35 per day per recipient. The manual pur-
chase procedure is also used for the one mobile vendor (a milk route) in the
Reading demonstration.

Establishing the EBT System Required Three Phases of Activity: Design, Devel-
opment, and Implementation

As system contractor, PRC was responsible for designing, developing,
and implementing the EBT System in Reading. All three phases of activity also
required substantial input from federal, regional, state and local food stamp
personnel; from retailers; from financial institutions, including the Federal
Reserve and the United States Treasury; and from local community service and
advocacy groups.

System Design. The solicitation for the demonstration specified the
functional requirements and special Food Stamp Program requirements for an EBT
system. PRC's major task during the approximately seven-month long design
phase was to prepare a detailed system design which could meet these require-
ments plus any other special needs or operating requirements of the parties
interacting with the system. These parties included the state and local food
stamp agencies, local retailers in Reading, and several tiers of financial
institutions (including AB&T, Federal Reserve banks, and the United States
Treasury). PRC held numerous meetings with representatives of these groups
during the design phase to determine their needs and to obtain their views on
early design plans.

PRC began preparing drafts of all training and users manuals during
this phase. In addition, an implementation plan and a written plan for subse-
quent system testing (once development was complete) were produced.

One of the major tasks performed by federal, state, and local food stamp personnel during this period was to review all written documents submitted to FNS by PRC. The reviews raised a number of issues that took time to resolve. The required actions included: making arrangements for authorizing manual transactions at any time during the day; specifying procedures for interfacing with the Federal Reserve system and the Treasury; and obtaining a waiver to allow use of the proposed programming language (PL/1). Because of the time required to deal with these issues, FNS did not authorize the start of system development until January 1984, nearly three months after the planned date.

PRC staff spent 3.2 person-years of effort in the seven-month design phase. The effort was predominantly devoted to system design and engineering and to developing training materials. In addition, food stamp staff at the national, regional, state and local levels spent about one person-year in monitoring, review, and problem resolution.

System Development. PRC's efforts during system development focused on hardware and software development and integration. Hardware development required acquiring all equipment necessary to develop a working prototype of the EBT system, fabricating cables to connect the BTTs and printers, and testing each hardware component and the complete system. Software development tasks included specifying the detailed design of each software module, writing code, testing and debugging individual modules, and testing and debugging the final integrated system.

The major event during system development was the Functional Demonstration Test. This was a formal test of the system's ability to perform the basic program functions specified in the solicitation and the final design document. Representatives from the federal, state, and local food stamp agencies and from AB&T participated in the test. They performed the functions for which they would be responsible during actual operations, and they acted as observers to the test. Several problems were noted during the test. After PRC and FNS resolved the problems, FNS authorized the start of system implementation activities.

While PRC staff performed the above system development tasks, they also prepared all training materials and procedures necessary for system implementation. Because staff from state and local food stamp agencies were to be responsible for all training of recipients during implementation, a high level of coordination between PRC and these agencies was required during this period.

The development phase required a total of nearly 16 person-years of effort. PRC staff spent 13.1 person years, principally in writing and testing software. Another 2.8 person-years were spent by food stamp staff at the national, regional, state, and local levels. Food stamp staff at all levels performed monitoring and review activities. In addition, state and local staff prepared to carry out functions such as transmitting issuance data, issuing benefit cards, and training recipients.

System Implementation. System implementation involved preparing for the start of system operations, training all demonstration recipients, and operating the EBT system from start-up (October 1, 1984) until the end of the training period (January 1985).

The first task in preparing for system operations was to install the EBT equipment in Reading. The EBT Center was established and the system's computers were moved from PRC's test facility in McLean, Virginia, to the EBT Center. Telephone lines and EBT equipment were installed in five Reading retail food outlets in preparation for a final acceptance test of the system. (EBT equipment at the Reading welfare office and at one retail outlet had been installed during the system development phase as part of the Functional Demonstration Test.)

After equipment installation, PRC performed the acceptance test of the EBT system. This test was similar to the Functional Demonstration Test held after system development. It was somewhat more comprehensive, however, and all equipment in the test was installed in appropriate Reading locations. Again, representatives from PRC, the relevant food stamp agencies, and AB&T acted both as participants and observers during the test. In addition, five food stamp recipients were trained so that actual EBT transactions could be included as part of the acceptance test.

After the System Acceptance Test was completed and problems identi-
fied during the test were resolved, PRC began installing EBT equipment in all
of the retail stores to be included in the demonstration. Some stores also
required additional telephone lines. These were ordered as the implementation
phase began, and the telephone company installed them before the BTTs were put
in place.

During this period PRC also trained all demonstration participants,
with the exception of recipients, to operate the system. PRC's EBT system
operators, state and local food stamp staff, and store managers and clerks
were all trained. A large group of "facilitators" (staff members from various
food stamp agencies) was trained to provide assistance to recipients and
retailers during the first week of system operations.

State and local food stamp staff trained demonstration recipients in
small group sessions at the Reading welfare office. Training occurred in
October, November, and January. The January training was originally scheduled
for December, but was postponed after the EBT system experienced several
problems in November. PRC worked throughout the start-up period to resolve
the problems, which ranged from minor equipment malfunctions to the system's
inability to function normally during peak shopping periods.

Implementation activities required a total of 9.5 person-years of
effort. PRC staff spent 5.8 person-years installing equipment, conducting and
responding to the System Acceptance Test, training participants, and operating
the EBT Center for four months. FNS national office staff spent one person-
year managing and monitoring the effort. Regional and state food stamp staff
spent 1.3 person-years, principally in start-up activities. Staff of the
Reading welfare office spent 1.4 person-years, mainly to train recipients and
issue their benefit cards.

The Reading Demonstration Has Provided Valuable Information about the Process of Establishing EBT Systems for the Food Stamp Program

As the first test of an EBT system in the Food Stamp Program, the
Reading demonstration provides a wealth of new information. For example, it
shows that retailers and recipients may respond quite favorably to an EBT

system, and that recipients make more purchases than one might expect. More-over, the Reading experience offers some lessons about problems that may occur in implementing an EBT system. Even though the system was implemented nearly on schedule and was well received by retailers and recipients, the demonstra-tion identified several problems and issues related to system design, system operations, and project management.

Retailer Reactions. Although food retailers nationwide have been slow to accept point-of-sale systems, virtually all eligible retailers elected to participate in the Reading demonstration. Several factors contributed to this result. PRC worked hard to win retailers' acceptance of the system and to make it responsive to their concerns. The system operated at very low direct cost to retailers. Retailers did not face a change in competitive position, because practically all stores in the area were participating. Finally, a store that did not participate would lose any food stamp sales that it would have gotten from recipients living within the demonstration area.

Retailer responses to the system, once it began operations, were quite favorable. In interviews conducted early in 1985, 72 percent of the participating retailers said they preferred the EBT system, while only 26 percent preferred the coupon system. Most retailers found the EBT system easier to deal with than coupons. They also liked not having to give back change in food stamp purchases, and they felt that the system reduced fraud and abuse. Their negative comments focused on extra time taken at the check-out counter, particularly because of system slowdowns, and difficulty in keep-ing track of deposits. Despite these problems, the general attitude was quite positive.

Recipient Reactions. Recipients also responded very positively to the EBT system. A survey conducted in parallel with the retailer interviews found that 74 percent of the recipients who had experienced both systems pre-ferred EBT over coupons. Only 21 percent preferred the coupon system.

Like the grocers, the recipients found the EBT system easier to deal with than coupons. They liked not dealing with coupon books and not going to the bank to exchange an ATP card for coupons. Very few said they had trouble

keeping track of their account balance or remembering their PIN. Some recipients, however, felt that paying for groceries was slower with the EBT system.

Benefit Use Patterns. Before the demonstration, no one knew how many purchases a recipient would make with a month's food stamp benefits--a critical parameter for designing system capacity. An average of five purchases was assumed for planning. As it turned out, households averaged seven to eight purchases per month.

Purchases were concentrated in the afternoon shopping hours of the days immediately following issuance. In February, the first month of full operations, benefits were placed in recipients' accounts on Monday, February 4. The shopping peak occurred between 4:00 and 5:00 PM on Wednesday. During that hour, recipients made 1.2 percent of the entire month's EBT purchases. The daily volume of purchases declined steadily after the issuance peak. Recipients made only 428 purchases on the last Wednesday in February, compared to 2,207 on the Wednesday after issuance.

System Design Problems. The EBT system generally performed its primary functions of issuing benefits to recipients, allowing them to make purchases, and transferring funds to retailers. The system did experience problems, however, some of which were related to system design.

System slowdowns, causing recipients and retailers to wait for purchase transactions to be processed, were the most persistent and troubling problem. Several design features contributed to the slowdowns. For example, the system design required retailer credits to be totaled in the afternoon hours, when peak purchase volumes occurred. The system design calls for two computers operating in tandem to provide a backup capacity, and this configuration required extra processing time to update the backup database. Messages between the two computers were executed sequentially for security reasons; parallel execution would be faster. In addition, the chosen programming language did not yield maximum processing speed. These factors, combined with the unexpected number of recipient purchases, led to slowdowns at peak shopping periods.

The dual computers were related to another problem with the original design. The design anticipated that processing would automatically switch to

the backup computer if the main computer failed. This turned out to be impossible with the hardware that had been chosen. The EBT Center therefore had to be staffed on a 24-hour basis, resulting in higher operating costs than planned.

Procedures for authorizing and crediting manual sales also proved to be a troublesome aspect of the design. Retailers found the authorization procedure cumbersome and disliked the $35 limit on household purchases per day. Moreover, they had difficulty reconciling their accounts because manual sales were not credited on a predictable schedule. (The retailer mails a manual sales form to the EBT Center, and the account is credited when the form reaches the Center.)

Retailers also experienced some difficulty in reconciling routine EBT purchases. The system totals credits for a 2:00 PM to 2:00 PM banking day, which does not correspond to retailers' normal accounting periods. Further, the system does not provide immediate information on deposits to retailer accounts. Some retailers resorted to an informal procedure of calling the EBT Center daily to obtain deposit information.

System Operation Problems. Some problems resulted not from the system's design, but from mechanical or human failures.

Equipment malfunctions occurred both at the EBT Center and in grocery stores. The Voice Input/Output unit, which responds to balance inquiries from touch-tone telephones, had persistent problems. Other equipment in the EBT Center had occasional need for repair or replacement. Problems with in-store equipment most often stemmed from improper use rather than mechanical failure. However, all BTTs were modified in January to prevent a transmission problem that sometimes caused the main computer to fail.

Operator errors sometimes occurred, but not in any systematic pattern. They served mainly as reminders of the need for detailed training, operation manuals, and supervision.

Issues of Contract Specification and Management. Apart from the problems visible in EBT system operations, some difficulties arose in the overall management and implementation of the demonstration. The problems point to several needs in a project of this type.

Clear and comprehensive performance criteria are needed to determine whether a system operates at acceptable levels. Specifying performance criteria is not easy: there is little experience on which standards can be based. However, the lack of such criteria contributed to the system design problems noted above. It also caused difficulties for both FNS and PRC in determining whether or not the system was operating at acceptable performance levels.

An agency sponsoring an EBT project also needs a source of technical expertise to evaluate the system. The need is greatest for evaluating initial proposals, reviewing design documents, and considering proposed modifications to the system design. In the latter two stages, the expert must have great familiarity with the specific hardware components and software languages used in the system.

Realistic scheduling is always difficult in development projects. The Reading demonstration indicates that this is not just a matter of estimating the time for assembling hardware and writing software. Delays stemmed mainly from the time required to resolve issues raised by design reviews and system testing. Long lead times for major equipment orders also can cause delays or impede rescheduling when delays occur for other reasons.

Finally, the demonstration illustrates an EBT system's need for close interaction between the system developer and food retailers. This is initially required to ensure retailer participation in the system. As the system starts operating, retailer training is critical. Continuing contact is then needed to deal with equipment problems, to ensure that retailers follow the intended procedures, and to communicate new information and suggestions for improved operations.

CHAPTER 1

SCOPE AND ORGANIZATION OF THE REPORT

Chapter One

SCOPE AND ORGANIZATION OF THE REPORT

The Food Stamp Program currently provides needy people with coupons which they can use to buy food at authorized retail outlets. The United States Department of Agriculture, Food and Nutrition Service (FNS), is responsible for administering this program. For several years, FNS has sought alternative ways to provide food stamp benefits. Its goal has been to find an issuance system that is more efficient, less costly to administer, and less vulnerable to fraud and abuse than the present procedures for issuing food stamp coupons.

One alternative issuance approach involves the application of electronic funds transfer (EFT) technologies. In 1982, FNS sponsored a study to examine the technical and economic feasibility of using these technologies to develop an electronic benefit transfer (EBT) system for the Food Stamp Program.[1] The study concluded that the technology necessary for an EBT system has been developed and proven successful, and that the costs of such a system appeared feasible relative to existing program issuance costs. The authors recommended that FNS sponsor a demonstration to test an EBT system within the administrative and operational environment of the Food Stamp Program.

Toward this end, FNS issued a solicitation in January 1983 seeking proposals from independent contractors to pilot test an EBT system in cooperation with state and local food stamp authorities, retailers, and financial institutions. As a result of this competitive procurement, an award was made to Planning Research Corporation (PRC) in July 1983 to design, develop, and implement an EBT system in Reading, Pennsylvania.

The Reading EBT system, an on-line system dedicated solely to the Food Stamp Program, began operations on October 1, 1984. The system became fully operational on February 1, 1985, after approximately 3,600 food stamp

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[1]Report on the Feasibility of an Electronic Benefit Transfer System for the Food Stamp Program, Silver Spring, Maryland: Birch & Davis Associates Inc. and The Orkand Corporation, March 1982.

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recipients in Reading received training in how to use the system. About 145 retailers currently participate in the demonstration, and about 3,300 recipients use the system each month to purchase groceries. Present plans call for the system to operate through the end of 1985.

1.1 THE REPORT DOCUMENTS THE READING EBT SYSTEM AND DISCUSSES THE PROCEDURES FOR IMPLEMENTING EBT SYSTEMS ELSEWHERE

The purpose of this report is two-fold. First, to document the establishment of the Reading EBT system, it addresses three questions:

* How does the system operate?

* What process was followed and what activities occurred during system design, development, and implementation?

* Who participated in these processes and how much effort was required?

The second purpose is to identify aspects of the Reading experience that offer guidance to food stamp authorities who may contemplate implementing an EBT system. Accordingly, the report considers a number of requirements to be met and issues to be addressed when designing, developing, and implementing an EBT system.

In discussing the requirements and procedures for establishing an EBT system, the report necessarily focuses on the Reading demonstration as the only "live" example of such a system in the Food Stamp Program. The Reading design is not the only feasible design for an EBT system, however. Systems can vary in several critical dimensions, such as on-line or off-line technology, stand-alone systems or systems shared with commercial users, and systems operated by Food Stamp Program personnel or systems operated by contractors. A multitude of specific hardware and software options exist. This report does not recommend any specific design. Rather, it identifies the elements needed in any system and their relationship to program functions. It also describes the programmatic context in which choices about system design and operations must be made.

This report does not evaluate the Reading EBT system; it simply describes the system's design and operating features. A major evaluation of the

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system's costs, its vulnerability to fraud and abuse, and its effects on recipients and retailers is in progress. That evaluation will be based on information from the full course of the demonstration.

1.2 A GUIDE TO READERS

Readers with varying interests in EBT systems may wish to focus their attention on different sections of the report, using the overview information in Exhibit 1.1. Relevant information on the design of the Reading EBT system and the procedures followed in establishing the system is repeated, where necessary, to facilitate the reading of individual chapters. Chapter Two discusses the design and operation of the Reading EBT system. Chapter Three describes the activities and level of effort required to establish the system. Chapters Four through Six draw from the Reading experience the requirements to be met, issues to be addressed, and procedures to be followed in designing, developing, and implementing an EBT system. Chapter Seven discusses many of the lessons learned from the Reading demonstration which pertain to establishing other EBT systems.

A glossary of terms and acronyms used throughout the report and a chronology of events during the establishment of the Reading EBT system are included as appendices.

Exhibit 1.1

A GUIDE TO SECTIONS OF THE REPORT

Topic	Report Sections
Description of Reading EBT system	See Chapter Two for description of system design and operations. Statistics on benefit usage and other system operations are included in Chapter Four. A glossary of terms is provided in Appendix A.
Process of establishing the Reading EBT system	See Chapter Three for discussion of activities performed and level of effort required to design, develop and implement the Reading system, as well as developing the solicitation. A chronology of events is provided in Appendix B.
Requirements, issues and procedures for establishing EBT systems elsewhere	See Chapters Four through Six for material on system design, system development, and system implementation, respectively. See Chapter Seven for discussion of lessons learned during the Reading demonstration which might aid the process of establishing an EBT system elsewhere.

CHAPTER 2

DESCRIPTION OF THE READING EBT SYSTEM

Chapter Two

DESCRIPTION OF THE READING EBT SYSTEM

The Reading EBT system is an on-line computer network using electronic funds transfer (EFT) and point-of-sale (POS) technologies to deliver food stamp benefits and to process food stamp purchases. The system eliminates the use of food stamp coupons to distribute program benefits. Instead, benefit cards issued to all demonstration households provide access to food stamp benefits placed in computerized accounts. Food purchases and retailer reimbursements are processed electronically.

The system began operations in Reading, Pennsylvania on October 1, 1984. Food stamp recipients were added to the system in phases through January 1985. The demonstration is scheduled to run through the end of 1985.

2.1 READING, PENNSYLVANIA IS THE EBT DEMONSTRATION SITE

In its solicitation for a contractor to design, develop, and implement an Electronic Benefit Transfer (EBT) system for the Food Stamp Program, FNS specified four criteria for site selection:

- The demonstration had to include between 2,500 and 4,000 food stamp households.

- The demonstration site had to be a contained shopping area so that most retail food outlets patronized by demonstration households could be included without extending the boundaries of the system over a large area.

- State and local food stamp authorities, local food retailers, and local financial institutions had to demonstrate a commitment to participate in the test. To ensure the testing of an EBT system over a range of operating environments, retailer commitments had to be obtained from supermarkets, chain-operated convenience stores, and independently owned small stores.

- The demonstration would include only the development and implementation of an alternative issuance system. If an automated certification information system was required for the proposed issuance system, the selected site had to have the certification system already in place.

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During its response to the solicitation, the successful bidder—Planning Research Corporation (PRC)—approached the Pennsylvania Department of Public Welfare (PDPW) to determine the state's interest in supporting a demonstration of an EBT system. Pennsylvania food stamp authorities expressed interest in the demonstration and had the capacity to provide the administrative and technical support for testing an EBT system. The state had experience with other alternatives to the normal issuance system (e.g., direct delivery of benefits) and was planning the distribution of photo identification cards to food stamp recipients in some areas. These cards could be integrated into the design of an EBT system. Pennsylvania also wanted to test paperless issuance systems to reduce fraud and had made preliminary preparations for a pilot project for the Aid to Families with Dependent Children (AFDC) program. Finally, Pennsylvania already had an extensive computer network connecting Harrisburg with all county assistance offices. This network transmitted certification information, computed benefit levels, and issued Authorization-to-Participate cards (ATPs) to recipients. The existing computer system, which included an automated Food Stamp Master File, could be adapted to transmit issuance data in an EBT system.

After considering a number of sites within Pennsylvania, PRC proposed the city of Reading as the demonstration site. PRC narrowed the site boundaries for participating households to the four central ZIP codes in Reading when, after contract award, it became apparent that the number of food stamp cases in Reading was larger than anticipated. When system operations began in October 1984, about 3,870 food stamp households (representing approximately two-thirds of the food stamp caseload in Berks County) resided within this area, meeting the first criterion specified by FNS. Based on a preliminary correlation of store redemption volumes and allotments by recipients' ZIP code locations, Reading also appeared to have a geographically contained shopping area with a wide variety of different types of retail outlets in the central city.

The retail and financial communities of Reading showed interest in the EBT experiment and quickly agreed to participate. Several factors presumably contributed to this interest. First, EFT and POS systems are currently being introduced in retail markets across the country, and the Reading demonstration offered retailers an opportunity to try these technologies on a trial

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basis at very low direct cost. (Equipment, communications, and transactions costs are being borne by USDA during the demonstration. Retailers, however, incur the labor costs of training their employees.) Second, the EBT system would allow local financial institutions to reduce their time-consuming role as coupon issuance agents. Finally, once it was clear that the demonstration would occur in Reading, retailers doubtless realized that failure to participate in the demonstration would reduce their volume of food stamp business.

About 145 stores in the center of Reading and the surrounding five-mile radius are currently participating in the demonstration. Another 17 stores have participated, but these stores have dropped out of the demonstration. Most of these stores have gone out of business. The participating stores include supermarkets, small- to medium-size grocery stores, convenience stores, stores selling both groceries and other goods (e.g., gasoline), specialty food stores, produce stands, and a milk route (based on USDA classifications of store types). The American Bank & Trust Company (AB&T), the main financial institution in the system, initiates a transfer of benefit funds from a USDA letter-of-credit account at the United States Treasury to retailers' commercial bank accounts. The letter of credit was established specifically for the demonstration.

A single welfare office, the Berks County Assistance Office (BCAO), serves all food stamp households in the demonstration area as well as those in the rest of Berks County. The caseload in the demonstration area is heterogeneous: about 27 percent of demonstration recipients are Hispanic, 19 percent are black, and 20 percent are elderly. Thus, the EBT system is being tested with a fairly diverse and, consequently, broadly representative group of food stamp recipients.

These characteristics of the Reading area must be kept in mind when considering the applicability elsewhere of particular features of the demonstration system. The limited number of recipients led to the selection of computer equipment and a networking design that might not be appropriate in a larger application. The geographically compact demonstration area limited certain kinds of logistical problems, such as servicing in-store equipment. The willingness of Reading retailers and financial institutions to experiment with new technology might not be found in all communities, and reluctant participants might demand different system features or implementation procedures.

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2.2 HOW THE READING EBT SYSTEM WORKS

The EBT system in Reading is an on-line computer network linking a central computer facility with about 145 retail food outlets in the Reading area, the welfare office in Reading, and the state welfare department in Harrisburg. The central facility, known as the EBT Center, contains two IBM Series/1 computers and is physically located within AB&T office space. A nearby annex provides additional work space and a location to store supplies and spare parts. The EBT Center processes all transactions generated within the EBT system and maintains current files on recipients' and retailers' account balances.

The state welfare department transmits benefits to recipients' accounts at the EBT Center. Recipients' regular monthly allotments are added to their accounts on specified days early each month, while supplemental, expedited, and prorated issuances are transmitted and added to the accounts daily.

BCAO issues plastic photo identification cards to all participating food stamp households. (Similar cards are used in other counties for identification purposes only.) The cards have a magnetic stripe on the back of the card and, except for the recipient's photograph, look very much like a credit card. The photo ID cards are converted to Benefit Identification Cards (BICs) for the demonstration when their magnetic stripes are encoded with a BIC number assigned by the EBT system and a "PIN offset." The PIN offset is a code based on the BIC number and a client-selected Personal Identification Number (PIN). The BIC number and PIN offset are used to verify that EBT benefits are obtained only by legitimate recipients.

Recipients purchase groceries at any retail food outlet participating in the demonstration. Each outlet is equipped with one or more Benefit Transaction Terminals (BTTs) at checkout counters. As illustrated in Exhibit 2.1, each BTT has a handset, which may be used to call the EBT Center for assistance, and a card reader. A PIN-pad and printer are attached to the BTT.

Immediately prior to any purchase, the store clerk passes the recipients' BIC through the BTT's card reader, and the recipient enters his or her four-digit PIN on the attached PIN-pad. The BTT internally checks the PIN entry with the encoded PIN offset to ensure that the card is being used by an

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Exhibit 2.1

Benefit Transaction Terminal and Printer

Pin Pad

Handset

Display Window for Amount
of Sales and Messages

Benefit ID C.
(BIC) Reade

Benefit Transaction Terminal (BTT) Printer

Benefit Transaction Terminal (BTT)
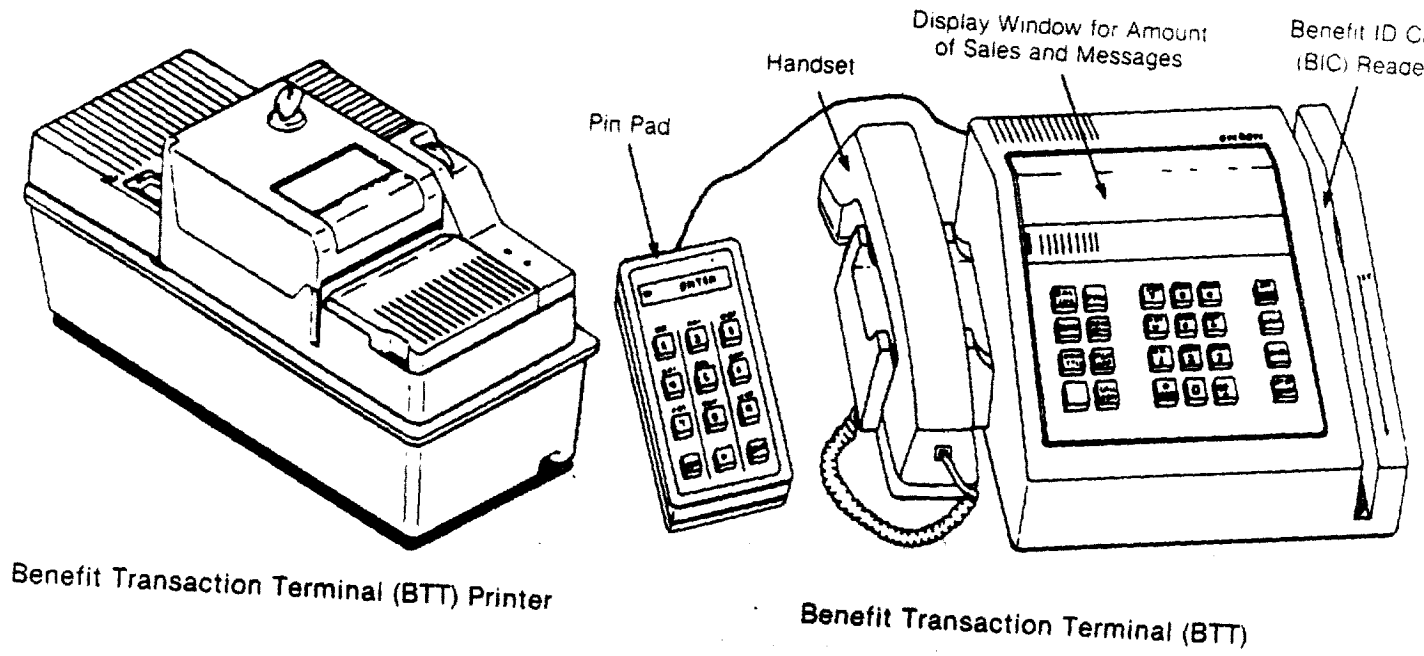
authorized person. Once the PIN is verified, the retail clerk enters the pur-
chase amount on the BTT and presses a "Send" key on the terminal. This action
electronically transmits the recipient and store account numbers, the PIN off-
set, and the purchase amount to the EBT Center over a commercial telephone
line. The recipient's account at the EBT Center is immediately debited by the
amount of purchase, and the retailer's EBT account is simultaneously credited
by the same amount.

After the end of each banking day (2:00 PM), the EBT Center elec-
tronically "bundles" all retailer credits for the day. The total credit for
each retailer is written on a computer tape which is hand-carried to AB&T's
data processing section. AB&T then transfers funds electronically through the
Automated Clearing House (ACH) network. The funds transfer passes through the
Federal Reserve System. Ultimately, the Food Stamp demonstration account at
the United States Treasury is debited by the day's total transactions, and
retailers' banks accounts are credited by the appropriate amounts.

The EBT Center has a backup computer to enhance system reliabil-
ity. Nevertheless, in the event that electronic transactions cannot be ac-
cepted at the EBT Center, retailers can manually process purchase transactions
(up to $35 per recipient each day) by calling the EBT Center and obtaining a
manual transaction authorization.

The demonstration EBT system handles food stamp transactions only.
However, the general design of the system would allow other kinds of point-of-
sale transactions as well, with some hardware and software modifications.

2.3. THE EBT SYSTEM PERFORMS SIX MAJOR FUNCTIONS

The EBT system does not affect the procedures for certifying a
household's eligibility for food stamps. Nevertheless, it changes some of the
procedures for authorizing benefits and nearly all the procedures for issuing
and redeeming food stamp benefits. This section describes the operations of
the EBT system for the following six functions and indicates its major differ-
ences from the current system, which issues benefits by Authorization-to-
Participate cards (ATPs):

- benefit authorization

- benefit delivery

- verification of recipient's identity

- recipient redemption

- retailer redemption

- bank redemption

In addition, this section describes the reconciliation process performed within the system and the management reports produced.

Benefit Authorization

Under both the ATP system and the EBT system, the state welfare department authorizes a certain amount of benefits for each recipient each month. The ATP system authorizes benefits through three steps: placing Household Issuance Record (HIR) data and current issuance authorization information on the Food Stamp Master File, printing ATP cards, and distributing ATP cards. In Berks County, ATP cards are mailed directly to recipients.

The EBT system does not alter the first step. Responsibility for maintaining and updating the Food Stamp Master File remains with the state welfare agency. The EBT system does make significant changes in the other two steps.

Benefit Issuance. The computer file that is normally used to print ATPs now contains an identifier on each household's record indicating whether or not the household is in the EBT demonstration. The records for demonstration households are extracted from the file every day, before it is used to print ATPs.

Each day's file extract, containing case numbers and authorized issuance amounts, is sent to the EBT Center. The state welfare department transmits supplemental, prorated and other non-recurring issuances electronically over a commercial telephone line. For the regular monthly issuances, which involve more cases, a computer tape is physically delivered to the EBT Center. Although regular issuances could be transmitted electronically, it

would take over five hours given the size of the file and the speed of trans-
mission.[1] Neither the state welfare department nor the EBT Center wanted to
tie up their equipment that long for the delivery of regular issuances.

When the EBT Center receives issuance information for new cases, it
adds account records to the EBT Master File and credits the corresponding
issuance amounts to the accounts. For existing cases, the issuance amounts
are added to the recipients' existing balances.

Card Issuance. Under the EBT system, the recipient's encoded Bene-
fit Identification Card (BIC) replaces the ATP card as the document authoriz-
ing the delivery of food stamp benefits. Instead of receiving a new ATP card
in the mail each month, demonstration participants receive only one BIC (un-
less a lost, stolen, or damaged BIC needs to be replaced).

A household that applies for food stamps usually gets its BIC about
four days after the application interview. The delay is necessary to verify
the information that the client provided, to determine eligibility, and to
transmit the necessary data to Harrisburg and the EBT Center. (Households
applying under the ATP system must wait about the same amount of time to
receive their initial ATP.)

The head of household goes to the welfare office to obtain the BIC
(though under certain circumstances, an authorized representative of the head
of household may make this visit). An issuance clerk takes the recipient's
picture and produces a photo identification card. The recipient signs the
card, which is then laminated to prevent tampering. The clerk then encodes
the photo identification card, which completes creation of the BIC, and the
recipient is trained in its use, as described below.

For households that were already receiving food stamps, the welfare
office issued photo identification cards--without encoding them--well before
the demonstration began. These households came to the welfare office as the
system began operating to have their cards encoded and to be trained to use
them.

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[1] The state welfare department and the EBT Center use 1200 baud modems
to transmit issuance data over a commercial telephone line. Faster transmis-
sion would require the use of a dedicated telephone line and higher speed
modems.

To encode the BIC, the issuance clerk first queries the EBT data base with the household's case number, using an IBM-PC microcomputer linked by telephone line to the EBT Center. The system responds with information about the recipient and a system-generated BIC number. The clerk then places the recipient's card in an attached encoding device and enters the BIC number on the microcomputer. The recipient selects a four-digit Personal Identification Number (PIN), which is entered on a PIN-pad attached to the microcomputer.

The system encodes three pieces of identifying information on the BIC: the BIC number, a PIN offset number, and a check-sum digit. The PIN offset number is computed by the microcomputer and is based on the BIC number and the PIN. The check-sum digit, also computed by the microcomputer, is based on the BIC number and the PIN offset and serves as an additional security feature. For security reasons, the PIN itself is not encoded on the BIC.

The clerk then passes the BIC through a card reader attached to the microcomputer. The microcomputer transmits this information to the EBT Center both to verify that the BIC number encoded on the card matches that generated by the system and to enter the PIN offset on the recipient's Master File record. Once the number has been verified, the clerk transmits the recipient's preferred language (English or Spanish) to the EBT data base.

After the encoding is completed, an income maintenance worker trains the recipient. The recipient learns how to use the BIC to purchase groceries, how to obtain information about his or her current account balance, and what to do and whom to call in the event of problems. The recipient practices using the BIC with EBT equipment like that located in the grocery stores.

To allow other members of the food stamp household or authorized representatives to purchase groceries, the recipient is given an Alternate Shopper Card. This card includes the recipient's name and case number, but it does not have a photo or a magnetic stripe. When the Alternate Shopper Card is used together with the recipient's BIC and PIN, a person designated by the recipient may buy groceries using the recipient's food stamp benefits.

When a BIC is lost, stolen, or damaged, the recipient notifies the welfare office. The welfare office passes on the information to the EBT Center, which places the recipient's EBT account on "hold." This prevents any

further transaction activity for the account. A new card is then assigned to
the recipient using the process described above. The household's EBT account
is updated with the new BIC number and PIN offset, and the hold status is
removed.

Benefit Delivery

Under the ATP system, recipients take their ATP cards to a local
issuance office to obtain food stamp coupons. In Reading, banks serve as
issuance offices. After the bank employee verifies the identity of the re-
cipient, the recipient exchanges the signed ATP card for the authorized amount
of food stamp coupons.

The EBT system essentially eliminates this step. Benefits are con-
sidered to be delivered when they are placed in the recipients' EBT accounts.

Verification of Recipient's Identity

The recipient's identity is verified at two points in the ATP
system. As mentioned above, bank employees verify the recipient's identity
when they accept the ATP card and provide food stamp coupons. The teller
compares the name and signature on the identification card with the name and
signature on the ATP card. In addition, when coupons are used to purchase
food items, store clerks may ask to see an identification card to ensure that
the purchaser is an authorized food stamp recipient.

Under the EBT system, store clerks are expected to check the photo
on the BIC before attempting the EBT purchase. If someone other than the
recipient uses the BIC to purchase groceries, that person must present the
recipient's Alternate Shopper Card.

The EBT system also verifies the identity of the recipient through
the four-digit PIN. A Benefit Transaction Terminal (BTT), located at the
checkout counter, performs the check. The checkout clerk passes the recip-
ient's BIC through the BTT's card reader and instructs the recipient to enter
his or her PIN on a PIN-pad attached to the BTT. The BTT internally computes
a PIN offset number based on the card's BIC number and the entered PIN. It
then compares the computed number with the PIN offset number encoded on the
card. If the offsets do not match, the recipient must re-enter the PIN. If

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the recipient fails to enter the correct PIN in three tries, the BTT will accept no further attempts to use the BIC until another recipient's BIC has been used at that BTT. After the third incorrect entry, the BTT automatically transmits information about the unsuccessful PIN entry to the EBT Center.

Allowing three attempts to enter the correct PIN at the BTT represents a compromise between maintaining system security and recognizing that recipients might have problems remembering their PINs. Multiple attempts to enter a correct PIN could represent an unauthorized person attempting to discover a recipient's PIN through trial and error. Recipients who forget their PINs must return to the welfare office and have their BICs re-encoded with a new PIN offset.

Recipient Redemption of Benefits

Recipients redeem their benefits in the ATP system by exchanging food stamp coupons for food items at authorized retail food outlets. In the EBT system, benefits are similarly redeemed when a recipient uses the BIC and PIN to purchase food items.

Electronic Purchases. In each participating store, nearly all checkout counters are equipped with BTTs, PIN-pads and printers. Recipients may make food stamp purchases at any counter that is so equipped.

After the checkout clerk rings up the sale, the BTT verifies the recipient's identity as described above. The clerk then enters the total food stamp purchase amount on the BTT and presses a "Send" key. The BTT automatically dials the EBT Center computer and transmits the following information:

- recipient's BIC number and PIN offset (which identifies the appropriate account)

- store, clerk, and BTT identification numbers

- purchase total

- Transaction Authorization Code (TAC), a number which the BTT computes, based on the data transmitted

The EBT Center, upon receiving the transmission, also computes a TAC and compares this with the transmitted TAC to ensure that the information has been communicated accurately.

The computer at the EBT Center verifies that a valid EBT account exists for the transmitted BIC number and PIN offset. If a valid account exists, the computer compares the recipient's balance to the purchase total. If the balance is larger, the recipient's account is debited and the retailer's account is credited by the purchase amount.

The EBT Center then sends to the BTT a message indicating that the transaction is complete. The BTT prints a two-part receipt with the following information:

- date
- time
- terminal code
- clerk's code (which is entered into the BTT by the clerk when the clerk's shift begins)
- store code
- amount
- balance in recipient's account
- recipient's case number
- type of transaction (either purchase or refund)

The checkout clerk gives the recipient one copy of the receipt. The other copy is retained on a journal tape within the printer and serves as the retailer's record of the EBT transaction.

If the recipient's balance is less than the purchase total, the BTT displays the difference. The recipient may pay this amount in cash or remove some items from the purchase. In either case, the clerk re-enters the transaction with the new purchase total.

Credits also can be transmitted through the BTT. If a clerk accidentally charges a recipient more than the amount of the purchase or if a recipient returns items for a refund, the clerk carries out a procedure very similar to that for a purchase. This results in a credit to the recipient's account and a debit to the store account. Such transactions require a "management override"; they can be processed only by individuals authorized by the store management.

Manual Backup Purchase Procedures. If an electronic transaction cannot be processed at the EBT Center because both computers are down, a recipient may still purchase up to $35 worth of groceries each day.

To accomplish a purchase in this situation, the clerk first passes the BIC through the card reader and has the recipient enter his or her PIN. After the BTT verifies the PIN, the clerk telephones an operator at the EBT Center to request authorization for a manual EBT transaction. The clerk tells the operator the client's case number (printed on the BIC) and the amount of purchase. The operator checks the previous day's recipient balance report of remaining balances for all recipients. If the recipient's balance is sufficient, the operator gives the clerk an authorization code and places a temporary debit against the recipient's account. The checkout clerk records this authorization code, the case number, the purchase amount, and the store's identification number on a three-part manual sales form. The clerk retains one copy for the store, gives one copy to the recipient, and sends the third copy to the EBT Center. The EBT Center checks the amount on the manual sales form against the temporary debit, and credits the retailer's account.

If an electronic transaction cannot be processed because the retailer's BTT is not working, no PIN check is performed. The clerk calls the EBT Center to request authorization for a manual EBT transaction. Again, the maximum daily authorization is $35. The operator checks the recipient's current balance before authorizing the sale and places a temporary debit against the recipient's account. The remainder of the process described above is then carried out.

Mobile vendors in Reading do not have access to BTTs. To process sales to food stamp customers, these vendors follow the same procedures used by other retailers when their EBT equipment is not working. The only differences are that the mobile vendors phone in transactions after they return to their office and that they are not limited to the $35 limit on manual sales.

Providing Balance Information. In the ATP system, recipients merely count their remaining coupons to determine their benefit "balance". Keeping track of the electronic balance in the EBT system is much different.

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In the EBT system, the EBT Master File at the EBT Center maintains information on each recipient's current balance. The EBT Center adds benefits to the recipient's account following the normal issuance schedule for Berks County. The recipient's purchases and refunds transmitted from a retailer's BTT are debited or credited to the accounts as they occur. In the event of system failure, the EBT Center uses the latest daily recipient balance report to maintain each recipient's current balance. Operators log manual transactions in a log sheet and maintain an ongoing client balance.

Recipients may determine their current EBT account balance by any of three methods. First, every time the recipient makes a food stamp purchase, the BTT receipt shows the remaining balance. Therefore, the most recent receipt usually shows the recipient's current balance. If the recipient's account has been credited with an issuance or debited with a manual sale since the last EBT transaction, however, the balance shown on the last receipt will be incorrect.

Second, recipients may check their current account balance by using a BTT. In addition to the regular terminals located at checkout counters, recipients may use balance-only terminals located in 23 of the larger stores or a terminal located at the welfare office. To obtain a balance, the recipient or clerk passes the recipient's BIC through the card reader and the recipient enters the PIN. After PIN verification, the operator presses a "Balance" key on the BTT to send a balance request to the EBT Center. The Center sends the recipient's account balance to the BTT, which displays it.

As with purchase transactions, recipients have three chances to enter a correct PIN to obtain balance information. After three incorrect PIN entries, the BTT sends an unsuccessful PIN entry message to the EBT Center. If the EBT Center receives three such messages for an account during a single banking day, the system will accept no further balance inquiries for that account until the next day. This limit is imposed to prevent unauthorized persons from obtaining balance information. The balance information "lockout" does not keep the recipient from purchasing groceries; the system continues to accept food purchase transactions when the recipient enters the correct PIN at a BTT.

Third, recipients can learn their account balance by using a touch-tone telephone to initiate a call to the EBT Center. The recipient dials a special number provided for balance inquiries. The number connects to the EBT computer. When it is dialed, a synthesized voice answers, "Hello, please enter your case number" (in both English and Spanish). After the recipient enters the case number, the voice unit responds (again, in both English and Spanish), "Please enter your Personal Identification Number." The recipient enters the PIN, and the voice unit responds (in either English or Spanish, depending upon the recipient's preferred language), "Your current benefits are..."

Retailer Redemption of Food Stamp Credits

In the ATP system, retailers redeem the food stamp coupons collected from recipients by counting their coupons, endorsing them, filling out a Redemption Certificate, and taking the coupons and the certificate to their local bank. The bank verifies the coupon amount with the retailer's Redemption Certificate and cancels all coupons with a bank stamp. After verifying the deposit, the bank credits the retailer's account.

The equivalent process in the EBT system is accomplished through the electronic transfer of funds to the retailers' accounts. Every afternoon, except weekends and legal holidays, the EBT Center totals each retailer's transactions for the prior banking day, which runs from 2:00 PM to 2:00 PM. The Center translates the retailers' account numbers and total transaction amounts into the standard National Automated Clearing House Association (NACHA) format used by financial institutions for electronic funds transfers. An EBT Center operator then physically delivers a tape containing this information and data on each retailer's bank to American Bank and Trust staff. AB&T currently requires that the delivery occur by 8:30 PM so that the bank can meet its Federal Reserve processing deadline of 12 midnight. During the first seven months of operations, AB&T required the EBT delivery by 4:30 PM.

Each night, AB&T transmits this deposit information to the Third District Federal Reserve Bank in Philadelphia. The Federal Reserve Bank debits its AB&T account by the sum of all retailer credits and distributes the

retailer credits to the retailers' bank accounts. Thus, the system is designed to credit retailers' accounts within one banking day following an EBT transaction.

Bank Redemption of Food Stamp Credits

With the ATP system, each retailer's bank redeems the food stamp coupons it receives. The bank ships the coupons, the Redemption Certificates, and a Food Coupon Deposit Document to the Federal Reserve System. The Federal Reserve Bank checks the amount of the coupons against the Redemption Certificates and the Food Coupon Deposit Document. After verification (which includes a check for counterfeit coupons), the Federal Reserve Bank credits the sending bank's account with an electronic funds transfer and debits USDA's account at the United States Treasury.

Bank redemption in the EBT system involves only AB&T rather than all of the retailers' banks. Reimbursement of AB&T's Federal Reserve account occurs when AB&T initiates a wire funds request through the Treasury Financial Communications System network. This request, which goes to the Federal Reserve Bank in New York (FRBNY), is made the morning after AB&T's account is debited by the Federal Reserve Bank in Philadelphia. FRBNY draws down USDA's letter of credit with the United States Treasury which has been established for the EBT demonstration. It simultaneously credits AB&T for the sum of the previous day's retailer credits.

Finally, the Treasury provides USDA with a daily report of the amount of the drawdown on USDA's letter of credit. USDA also has an on-line capability of checking its account activity at any time.

Benefit Reconciliation and Management Report Production

The ATP and EBT systems both generate reconciliation reports to ensure that benefits are distributed appropriately. In the ATP system, for example, one reconciliation compares the ATPs issued by the state welfare department to the ATPs accepted for coupons by issuance agents. Another reconciles the current inventory of coupons held by an issuance agent with previous inventory, additional coupons received, and benefits issued in exchange for ATPs. Reconciliation in the EBT system is more comprehensive because the

system can track benefits from the state welfare department to the recipient to the retailer's bank account.

Account balances and benefit transfers are reconciled at numerous points in the EBT system. The major reconciliations occur when benefits are issued by the state welfare agency, when accounts and daily EBT purchase transactions are balanced, and when retailer accounts are credited through the Automated Clearing House (ACH) funds transfer network. In addition, retailers may balance their sales receipts against deposits to their bank accounts, and retailer deposits are checked against drawdown of USDA's letter of credit with Treasury.

Reconciliation of Issuances. The EBT Center and the Pennsylvania Department of Public Welfare (PDPW) take two steps to reconcile benefit issuances to the EBT Center. First, daily transmissions from PDPW to the EBT Center are edited when received. The last record of each transmission contains totals for the number of cases and the dollar amount of benefits to be updated. The EBT Center rejects the transmitted file and notifies PDPW if the edit shows that the issuance records do not sum to either the case total or the dollar total. PDPW and the EBT Center immediately investigate and resolve the discrepancy.

For the second step, the EBT Center creates an acknowledgement file of all issuances placed in recipient accounts. This file has the same format as the tape files that PDPW produces when local issuance offices submit information on ATPs that have been redeemed. The state welfare department calls the EBT Center about twice each month to request that these files be combined, copied to tape, and delivered to Harrisburg. PDPW then combines the EBT tape with its own tapes to conduct a statewide reconciliation of all issuances.

Account and Transaction Reconciliation. The EBT Center reconciles all account balances and transaction activity each day after 2:00 PM. The Center produces a three-part System Daily Reconciliation Report using informatio in the EBT Master File and History File. The report covers recipient activity, retailer activity, and PDPW and AB&T activity.

The section covering recipient activity checks each account and the total for all accounts. It computes the recipient's current balance as follows:

$$\left\{ \begin{array}{l} \text{Unused benefits from prior months} \\ + \text{ Total issuances for the month} \\ - \text{ Total food purchases for the month} \\ + \text{ Total refunds for the month} \\ - \text{ ATP purchases for the month} \end{array} \right\} = \text{ Current balance.}$$

The reconciliation compares this balance to the balance recorded in the EBT Master File. Manual sales that have not yet been reconciled against the EBT Center's copy of the manual sales form are subtracted from the "unused benefits" entry in the above equation. Once the manual sales form reaches the EBT Center, manual sales are included in the "total food purchase" entry.

The section checking retailer accounts and activity uses a similar formula:

$$\left\{ \begin{array}{l} \text{Total sales for the month} \\ - \text{ Total refunds for the month} \end{array} \right\} = \left\{ \begin{array}{l} \text{Total deposits for the month} \\ + \text{ Total deposits on hold.} \end{array} \right\}$$

Manual sales are included in the "total sales" entry after the EBT Center receives its copy of the sales form. "Deposits on hold" pertain only to newly authorized and equipped retail outlets that have not yet had their bank accounts listed in the ACH network. It takes about ten days after notification to establish retailer, bank, and account numbers in the ACH network. The EBT Center holds any deposit credits until the account is established.

The reconciliation for recipients and retailers produces totals for the current day as well as for the month to date. Each day's total net debits (purchases minus refunds) for all recipient accounts are balanced against each day's total net deposits (sales minus refunds) for all retailer accounts.

The third section of the reconciliation report compares total funds received from PDPW to the sum of total funds remaining in recipients' accounts and total funds that have exited the system. Funds exit the EBT system either through transmission of deposits to AB&T or through conversion of benefits to ATPs.

EBT Center staff investigate and resolve any discrepancies discovered in the System Daily Reconciliation Report.

Deposit Reconciliation. When the EBT Center delivers the retailer bundle-up tape to AB&T, the bank checks the tape format and prepares a listing of all retailer accounts and deposit amounts on the tape. AB&T returns the tape and listing to the EBT Center after the deposit information is entered

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into the ACH network. The EBT Center verifies the accuracy of the deposit information by comparing the listing with its own records of store deposits for the day.

Other Reconciliation Activities. Once they enter the ACH network, deposits from the EBT demonstration are subject to the same reconciliation procedures as any other fund transfers. This process affects all transactions between AB&T, Federal Reserve Banks, the United States Treasury, and all banks holding retailer accounts.

Retailers may reconcile their EBT transactions and deposits by comparing their BTT transaction receipts with deposit information provided by their banks. Retailers also can call the EBT Center to inquire about daily transaction totals, although this is not a formal element of the system.

The Food and Nutrition Service reconciles retailer deposits against drawdowns of its letter of credit at its Regional Data Center in Minneapolis. Once a week, the EBT Center sends a tape to Minneapolis which details daily deposits by individual retailers. Every month the EBT Center reports to FNS the total benefits issued to recipients, the total that recipients redeemed, and the total that retailers redeemed. The state welfare department also submits information on the total benefits it authorizes each month. FNS uses these reports to check the flow of benefits through the EBT system.

The EBT Center, on request, can provide additional audit reports. These reports are generated from the History File, which records all transaction activity during the demonstration.

Management Reports. In addition to reconciliation reports, the EBT system produces a number of management reports. These include statistical summaries of monthly activities, system trouble reports, and logs of problems reported by retailers.

The reports serve two functions. First, by documenting the level and nature of system activity, they provide a description of what happened during the EBT demonstration in Reading, which is one of the primary purposes of the demonstration. Second, the reports allow PRC and food stamp authorities to monitor system activities and problems. They make it possible, for example, to identify households that are not using their food stamp benefits,

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to observe any sudden increase in unsuccessful PIN entries, and to identify
irregular patterns of store redemptions.

CHAPTER 3

SYSTEM DESIGN, DEVELOPMENT, AND IMPLEMENTATION

Chapter Three

SYSTEM DESIGN, DEVELOPMENT, AND IMPLEMENTATION

Establishing the EBT system in Reading involved four stages of activity. First, the Food and Nutrition Service (FNS) solicited proposals from independent contractors and awarded a contract to Planning Research Corporation (PRC). Second, PRC, FNS, and others decided how the final system would operate. Third, PRC developed and tested a working prototype of the EBT system. Fourth, PRC installed the EBT equipment in Reading, established the EBT Center, trained participants, and operated the system.

This chapter presents a brief history of these four project stages. (Appendix B presents a chronology of demonstration events through January 1985.) It identifies the major activities carried out in each stage, the roles of the various involved organizations, and the level of effort required. This chapter does not attempt to document all of the activities or problems that had to be resolved, although it cites some examples of issues that may arise in establishing an EBT system in other locations.

3.1 DEVELOPING THE SOLICITATION

FNS Sought Alternatives to the Coupon System

Current benefit delivery systems in the Food Stamp Program are costly and difficult to administer. In many areas, ATPs must be printed and mailed either to issuance offices or recipients. Food stamp coupons must be printed, stored, distributed, processed, and ultimately destroyed. Because coupons are valuable, they are vulnerable to abuse and theft. Coupons and ATPs may be stolen (or falsely reported as stolen), recipients may sell coupons instead of redeeming them for authorized food items, and coupons may be counterfeited.

Because of these problems, federal and state food stamp authorities have wanted to develop less costly and more secure ways to provide food stamp benefits. In May 1981, FNS announced a plan for demonstration projects to develop and test alternative issuance systems. State and local agencies were

invited to submit proposals indicating their interest in conducting a demonstration project and describing their proposed systems.

FNS Funded a Feasibility Study

Meanwhile, FNS explored possible alternatives to the coupon system. FNS awarded a contract to Birch and Davis Associates (with a subcontract to the Orkand Corporation) to assess the technological and economic feasibility of developing an electronic benefit transfer system to deliver and control food stamp benefits. It seemed likely that the feasibility study would shed light on what kind of demonstration projects should be funded. FNS therefore temporarily suspended the solicitation for proposed demonstrations in November 1981.

The Birch and Davis study, released in March 1982, examined three alternative EBT system approaches:

- An on-line system used solely for the Food Stamp Program (called a dedicated or stand-alone system)

- An on-line system shared by the Food Stamp Program and other commercial users (called a piggybacked system)

- An off-line system dedicated to the Food Stamp Program (also called stand-alone)

On-line and off-line EBT systems differ in how and when they record, process, and communicate information on food purchases. On-line systems incorporate direct communication links between retail outlets and a central computer facility; each sale involves an immediate contact with the central computer to adjust the recipient and retailer accounts. In contrast, off-line EBT systems store recipient benefit information on individual household cards or devices that have a machine-readable memory. A recording device at the retail outlet accumulates information on food stamp sales, which must later be delivered to the system's computer facility, either by an electronic communication or by physical delivery.

The Birch and Davis study concluded that on-line systems were technically and economically feasible. Either stand-alone or shared systems would be feasible, but shared systems would require lower initial capitalization and operating costs. Because off-line systems had not been fully tested, the study did not document their technological feasibility.

The study pointed out that retailer acceptance would play a key role in the success of any EBT system. Thus, it recommended that FNS sponsor a demonstration to determine the feasibility of implementing an EBT system for the Food Stamp Program. A demonstration would provide evidence on retailer acceptance of EBT systems and also document the experience of implementing an EBT system within the operating environment of the Food Stamp Program.

In light of the feasibility study's findings and the technical expertise that would be needed to develop an EBT system, FNS changed its research strategy. It cancelled the original solicitation to state and local agencies in May 1982. Instead, it decided to solicit proposals from independent contractors to design, develop, and implement a system in cooperation with state officials.

FNS Issued the Solicitation for the Demonstration

FNS staff within the Division of Family Nutrition Programs began drafting the new solicitation in April 1982. Two separate solicitations invited proposals for electronic and paper-based alternatives to the coupon system. No paper-based system was funded, however, because FNS did not receive any technically responsive proposals for such a system.

The EBT solicitation did not call for a particular system type or specify explicit performance standards. Rather, it posed a number of functional and special requirements that any proposed system would have to meet (see Chapter 4 for more detail). Prospective bidders had maximum flexibility in designing a system which could meet the requirements established by FNS.

An unusually large number of people and organizations helped prepare the solicitation. FNS staff met with representatives of the retail food industry to discuss industry concerns about an EBT system. Because people throughout the Department of Agriculture were interested in EBT systems and their impact on Food Stamp Program operations, an Intradepartmental Advisory Panel was formed in May 1982 to review drafts of the solicitation. This panel included representatives from the Office of the Assistant Secretary for Governmental and Public Affairs, the Office of the Inspector General, the Office of the General Counsel, and the Office of Information Resources Management.

FNS also hired the Mitre Corporation, a systems engineering firm, to assess the solicitation's technical soundness.

The official notice of the forthcoming solicitation appeared in the Commerce Business Daily in June 1982. FNS then issued a draft request for proposals (RFP) in September. Its purpose was to test the operational feasibility of the system specifications and to allow potential contractors the opportunity to raise questions about the technical and the contractual aspects of the project. The final RFP was issued in January 1983.

The final RFP specified that each offeror propose a site for implementing the EBT demonstration and obtain preliminary commitments from all the major participants in the demonstration (including the state and local food stamp authorities, retailers, and local financial institutions). Depending upon cost considerations, more than one demonstration might be funded as a result of the solicitation. Each award would be divided into three phases: Phase I - Design; Phase II - Development; and Phase III - Implementation. Phases I and II together would run for a minimum of eight months and a maximum of 12 months. Phase III would last 18 months. At the end of Phase I and Phase II, the government would decide whether or not to proceed with the next phase.

Level of Effort for Preparing the Solicitation

From April 1982 to January 1983, FNS spent approximately 1.2 person-years of effort writing, reviewing, and issuing the solicitation. This does not include the work performed by Mitre Corporation. This unusually large effort reflects the large number of people within USDA who were interested in the concept of EBT systems and whose offices would be affected by the change in program operations. The Intradepartmental Advisory Panel met several times during this period to review drafts of the solicitation. The decision to issue a draft RFP and request comments from interested bidders also extended the time and effort required to develop the solicitation.

Demonstration Contract Awarded to PRC

Proposals had to be submitted by March 8, 1983, fifty-seven days after issuance of the RFP. All proposals went through a series of evaluation reviews. The formal evaluation panel included representatives from the Office of Analysis and Evaluation within FNS, FNS's Office of Information Resources Management, and FNS staff representing the coupon issuance and redemption office, the retailer/wholesaler office, and the automated data processing office. In addition, the Office of the Inspector General and an EFT consultant hired by FNS reviewed all proposals. Based on technical merit and cost, a single award was made to Planning Research Corporation (PRC) of McLean, Virginia, in July 1983. The contract called for reimbursement on a cost-plus-fixed-fee basis.

3.2 SYSTEM DESIGN – PHASE I

Initial Design Activities and Issues

The PRC proposal presented a preliminary design for the Reading EBT system. Detailed design work began following the contract award. The project staff saw their major task as designing a system which could satisfy the requirements of all major participants in an EBT system. These participants included state and local food stamp staff, retailers, food stamp recipients, and financial institutions.

PRC held a number of briefings and question-and-answer sessions in Reading during the initial design period. These meetings were intended to make sure the system would be operationally feasible and would address all requirements established by FNS. The staff at the Berks County Assistance Office and PRC met with groups of local retailers in August. A session for local financial institutions was held in September. PRC and BCAO also held a series of meetings with local community organizations in September. Finally, throughout the entire design phase, FNS and PRC staff held biweekly meetings to discuss specific design issues and overall contract management.

Throughout this period, PRC disseminated information more broadly in the community. Project staff prepared and distributed publicity materials and advance notices about the demonstration to the local news media.

As the design work progressed, PRC and FNS had to resolve many issues concerning the system design and the operation of the demonstration. For example, they had to decide which retailers in the Reading area should be allowed to participate in the demonstration. The four central ZIP codes of Reading had been designated as the demonstration site shortly after contract award; food stamp recipients living in this area would participate in the demonstration. No one knew, though, how often these food stamp households shopped at stores located outside the designated area. FNS wanted the demonstration to accommodate households' existing shopping patterns as much as possible.

To address this issue, PRC--with support from FNS's Mid-Atlantic Regional Office and the local welfare office--conducted a shopping pattern analysis. Because project resources could not support a survey of food stamp households asking them where they shopped, the analysis concentrated on the authorized food retailers. Key questions concerned where the retailers were located within Berks County, their accessibility to central city residents, their volume of food stamp sales, and the number and types of stores in selected parts of Berks County. FNS finally decided to allow all authorized food stamp retailers within a five-mile radius of downtown Reading to participate if they desired.

Another issue concerned the schedule for delivering benefits to food stamp households in Berks County. At the beginning of the design phase, the state welfare department issued benefits on a staggered ten-day schedule. The department changed to single-day issuance to integrate the delivery of food stamp benefits and cash assistance from other programs. This change was important for EBT system operations because, with benefits issued on the same day for all demonstration households, peak loads on the system would be greater than under the original staggered issuance schedule.

PRC submitted a draft system design document to FNS on September 12, 1983. Later in the same month, PRC provided drafts of users' manuals, training manuals, a test plan for FNS's acceptance of the system prior to implementation, and a plan for implementing the system in Reading.

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Design Undergoes Critical Review

On October 20, representatives from FNS national and regional offices, the state welfare department, the USDA Office of the Inspector General, American Bank and Trust, and PRC met to review PRC's proposed design for the EBT system. Among the many issues addressed during the meeting, the following had the greatest impact on final system design.

- The original design called for Berks County Assistance Office staff to authorize manual transactions in the event of system failure. State welfare department representatives indicated that this procedure could work only during normal office hours. Therefore, it was decided that PRC would handle all manual backup at the EBT Center. FNS would provide a blanket, advance authorization for benefits to be delivered during system downtime.

- Although original plans called for the EBT system to operate 24 hours each day, the EBT Center was to be staffed only during normal business hours. To accommodate its additional responsibilities with respect to handling manual backup, EBT Center staffing needed to be expanded to 18 hours each day (from 6:00 AM to midnight). PRC agreed to install at least two terminals in all stores open 24 hours so that, in the event one terminal failed between midnight and 6:00 AM, the other terminal could be used to process transactions.

- PRC's detailed design recommended the use of PL/1 as the system's programming language (instead of COBOL, as envisioned in PRC's original proposal). Because PL/1 is not a federally approved programming language, this required a special waiver.

- The state welfare department expressed an interest in having the benefit cards encoded during the recipient's certification at the welfare office. This would eliminate the need for recipients to return for a second visit. However, this approach required encoding cards before the EBT Center had received issuance data--that is, the recipient would have an encoded card before a usable account had been established. As a result, the original two-visit procedure ultimately prevailed. Photo identification cards were issued during certification, but they were encoded only when the recipient returned for EBT training.

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One major design issue went unresolved during the meeting: the exact relationship between the EBT system and financial institutions in electronically transferring funds to retailer accounts. Preliminary discussions on this issue had been held with representatives of the United States Treasury. These talks made it clear that direct contact with Federal Reserve representatives was necessary, and this could not be arranged until Phase II.

Other issues addressed during this design review concerned establishing procedures that would allow someone to shop for the recipient without compromising the security of the recipient's PIN; reconciliation reporting requirements; the legality of printing recipients' account balances on the EBT receipt; actions to be taken by cashiers and recipients in the event of disputes; and standards to be met by PRC in servicing faulty store equipment.

Phase II Authorized

Because the Critical Design Review raised a number of issues that required some time to resolve, FNS did not authorize PRC to proceed with Phase II until January 24, 1984. To minimize schedule delays, however, FNS authorized PRC to begin some Phase II activities prior to January 24. These activities included training programmers in PL/1, preliminary development of programming specifications, preliminary development of system software, and ordering hardware components with long delivery schedules.

Level of Effort for the Design Phase

The design phase of the contract lasted nearly seven months (from July 1, 1983, to January 24, 1984). During this period, staff from PRC, FNS, and the regional, state, and local agencies spent a total of approximately 4.2 person-years performing activities related to the demonstration. PRC performed most of this effort (about 3.2 person-years).

PRC's effort was spent in system design and engineering (62 percent), development of training materials (20 percent), development of plans for later system testing (6 percent), some development of system software (2 percent), and overall program management (10 percent). Computer system scientists and other scientists working in advanced design, engineering, and quality control functions accounted for about 15 percent of PRC's total

effort. Their responsibilities included preparing an overall system design that would address all functional and special requirements specified in the RFP, ensuring that the system design would meet the needs of all demonstration participants, specifying how individual components of the system would work, and resolving all design problems identified during the development of specific design elements. Senior systems analysts performed another 30 to 40 percent of the effort. These analysts were responsible for converting general design specifications into detailed plans for how each design element would function.

FNS staff from the national office spent approximately 0.8 person-years during the seven-month period dealing with demonstration activities and issues. These activities included the biweekly meetings with PRC, attending some of PRC's briefings in the Reading area, reviewing all written documents submitted by PRC, preparing for and moderating the Critical Design Review, following-up issues raised during the design review, and handling the contract activities needed to authorize the start of Phase II (as well as the early authorization of some Phase II activities during Phase I).

The remaining effort (about 0.2 person-years) was split among staff from the FNS regional office, the state welfare department, and BCAO. All three organizations reviewed PRC's design documents and participated in the Critical Design Review. Each organization also participated in decisions regarding the boundaries for the demonstration. Finally, BCAO staff assisted PRC in the briefings and other meetings held in Reading during this period.

3.3 SYSTEM DEVELOPMENT - PHASE II

Activities Required to Develop the System

To develop a working prototype of the EBT system, PRC had to obtain or develop numerous hardware and software components and then make them work together. The major tasks are described below:

Ordering and Modifying System Hardware. Delivery of hardware components often required long lead times. For example, nearly 60 days elapsed between order and delivery of each of the two IBM Series/1 computers, and 90

to 120 days elapsed before delivery of the Benefit Transaction Terminals (BTTs).

In some cases, PRC modified equipment to perform the functions required by the system design. For example, PRC reprogrammed the BTTs to perform the internal PIN verification check.

Writing and Testing Software. PRC wrote software modules for nearly every major function the EBT system would perform. These functions included: communications among the system's computers, BTTs, AB&T, the local welfare office, the state department of welfare, and food stamp recipients; communications between the local and state offices; database creation and maintenance; transaction processing; report generation; maintaining history data on all system activity; and communications between the two IBM Series/1 computers. Software for this latter function was particularly difficult to develop, primarily because the two computers were not ordered at the same time and could not be factory-integrated.

PRC then integrated and retested all software modules to ensure that all linkages between the modules operated as planned.

Resolving Further Design Issues. Some additional design effort was made during the development process. For example, federal and state regulations governing the Food Stamp Program were reviewed to determine waiver requirements for the demonstration. FNS used the general waiver provision that falls under the Food Stamp Regulations' demonstration authority to meet these requirements. Other design issues involved decisions about the EBT Center's interface with AB&T, the Federal Reserve System, and the United States Treasury; procedures for handling transactions from mobile vendors; procedures for using the Alternate Shopper Card; and formats and contents for all system management and evaluation reports.

Activities Related to Preparing for System Implementation

During this period, PRC and food stamp authorities also performed a number of preparatory tasks for implementing the system.

Retailer Enrollment. Most of the food stamp authorized establishments in the central four ZIP codes of Reading enrolled in the demonstration

during the design phase of the project. Retailers within the five-mile radius of downtown Reading, but outside the central ZIP codes, enrolled during the system development phase.

The enrollment process was similar for the two groups. Periodically, the FNS regional office provided PRC mailing labels for all authorized retailers in Berks County. During the design phase, PRC used these labels to mail an enrollment packet to retailers within the four ZIP codes. The packet contained a letter describing the demonstration and a form on which retailers could indicate their desire to participate or not participate. By the end of the design phase, about 90 retailers had enrolled in the demonstration.

Enrollment of retailers outside the four central ZIP codes did not occur until the official boundaries for the demonstration had been determined. The day preceding the announcement of the final boundaries (February 17, 1984) PRC mailed enrollment packets to all 61 stores within the five-mile radius not located within the four central ZIP codes. About 20 of these stores initially elected to enroll in the demonstration.

In mid-February, the FNS regional office sent a letter to all retailers already enrolled in the demonstration giving an update of the project's status. The letter also told them of an upcoming survey that would determine each store's equipment and telephone line needs. PRC held a general information meeting on February 23 for all interested retailers in the Reading area.

During this period, PRC, FNS, and the regional office worked out final procedures for updating the status of retailers participating in the demonstration. The EBT Center and the FNS field office in Philadelphia would notify each other of all known changes in retailer status, including new retail store authorizations in the Reading area, store disqualifications from the Food Stamp Program, changes in store ownership, store closings, and retailer decisions to drop out of the demonstration.

Site Equipment Needs Survey. To determine hardware and telephone line needs among enrolled retailers, PRC conducted a store survey during March and April. This survey determined the number of checkout counters to be

equipped with EBT equipment (BTTs, PIN-pads and printers), power line require-
ments for the EBT equipment, telephone line requirements, and any hardware
requirements for mounting the BTTs at the checkout counters.

Distribution of Photo ID Cards. To avoid delays during system
start-up, the Berks County Assistance Office began issuing recipients' photo
identification cards on April 4, 1984. Staff issued these identification
cards and flyers describing the upcoming project through special distribution
procedures. Although recipients received their cards in advance of the
demonstration, the cards could not be used to access EBT-issued benefits until
they were encoded during recipient training sessions.

Training of Retailers and Recipients. A great deal of effort during
Phase II went into planning the retailer and recipient training. PRC produced
final versions of all lesson plans, training materials, and a videotape show-
ing recipients how the system would operate, based on FNS and state review of
the draft materials. PRC and the state and local welfare agencies completed
plans for training, including when and where training sessions would be held,
how many people would be trained during each session, and the length of each
session.

Implementation Plan. PRC also completed its Implementation Plan for
the demonstration during the system development phase. This plan detailed the
installation requirements for all EBT equipment and communication links re-
quired by the EBT system. Separate sections covered the EBT Center, the
workstation in the Reading welfare office, retailers, and the state welfare
department. Each section discussed the physical characteristics of the equip-
ment to be installed, the electrical and environmental requirements of the
equipment, floor plans showing the planned location of all equipment, and
supply requirements. The plan also set forth the implementation schedule for
installing all hardware and telephone lines, for software installation at the
EBT Center, for system testing, and for retailer and client training.

Testing the System Prototype

The final major task during Phase II was the Functional Demonstra-
tion Test of the EBT prototype. PRC installed equipment for the demonstra-

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at the welfare office and at one retail store in Reading. The central computers were located at PRC's headquarters in McLean, Virginia. The test occurred from July 20 through July 25, 1984, and observers from PRC, FNS, the state and local welfare agencies, and AB&T watched the system closely.

The functional test covered most major aspects of the EBT system's operations. The state welfare department created an issuance file on tape and physically delivered it to PRC. PRC loaded it onto the system's data base. Staff at BCAO tested nearly all communication functions with the EBT system. These functions included initializing a benefit card for one recipient, updating records, and querying the EBT Master file for account information. BTT functions were tested from the test store, and the system processed several dummy transactions and one actual transaction. PRC processed the actual transaction and delivered the data on tape to AB&T. AB&T then entered this deposit information into the Automated Clearing House (ACH) network, and the ACH network deposited funds into the test retail store's account at its local bank. The test also included verification and reconciliation of all transactions and system processing. The demonstration did not test all system functions. Most notably, the test did not include an electronic transmission of benefits from the state to the EBT system.

The Functional Demonstration Test revealed several system problems. For example, the BTT's internal PIN verification procedure incorrectly accepted the BIC as valid when PIN digits were transposed, and the time required to process transactions (about 75 seconds) was longer than expected.

PRC moved immediately to overcome these omissions and problems. It successfully demonstrated an electronic transmission of benefits from the state to the EBT system on August 8. After modifying the firmware within the BTT to correct the problem of accepting transposed PIN digits, PRC successfully tested this modification on August 6. Finally, PRC attributed the slow transaction speed during the test to several factors: the test store had a rotary telephone rather than a touch-tone telephone; long distance lines instead of local lines were used; and some time-consuming error tracking features had been added specifically for the test. PRC indicated to FNS that, in a more routine operating environment, transaction times would be comparable to response times found in automated teller machines (ATMs).

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Addressing Final Development Issues

Several other issues required resolution after the Functional Demonstration Test before FNS would authorize PRC to implement the system.

Potential Cost and Security Impacts of Splitting the EBT Center Into Two Office Locations. Although the original plan had placed the entire EBT Center within AB&T office space, limited space at AB&T required moving some EBT Center personnel to another location. PRC informed FNS that having two offices instead of one would change neither staffing requirements nor system security. The additional space would be used to house supplies and spare BTTs. It also would serve as a work area for the technicians servicing the terminals. The computers and EBT Center computer operations would remain at the AB&T location.

Adequacy of Procedures for Switching to the System's Backup Computer. In its original proposal, PRC had expected that system processing could be switched from the primary to the backup computer without operator intervention. During the system development phase, however, PRC learned that the switch did need operator intervention. Because PRC personnel would staff the EBT Center only from 6:00 AM to midnight, PRC recommended that failure of the primary computer trigger an alarm during the other six hours. AB&T security personnel, upon hearing the alarm, would perform the simple steps to switch to the backup computer. FNS needed a statement on PRC's relationship to AB&T to determine who would be responsible if the bank employee failed to implement the switching procedure correctly. PRC affirmed its ultimate responsibility for all system operations.

(Just prior to system start-up, PRC learned that AB&T personnel would not be available at night to perform this function. In addition, shortly after start-up, PRC discovered that the EBT Center needed to be staffed nearly 24 hours each day to perform all system activities. FNS authorized full-time staffing of the Center in January 1985. Thus, the issue of AB&T's role in switching to the backup computer became moot.)

Need for a Written Agreement Between the PDPW and AB&T. This agreement settled the state welfare department's financial obligation to the bank for processing retailers' deposit information. PRC provided a letter from AB&T describing these arrangements.

Bonding of PRC Employees. FNS expressed concern over what type of bonding PRC would provide for its employees for possible liability during the demonstration. PRC arranged for a fidelity bond to cover employees at the EBT Center.

Phase III Authorized

On August 9, 1984, after PRC had addressed the above issues and the technical problems noted during the Functional Demonstration Test, FNS authorized PRC to proceed to Phase III.

Although the original schedule anticipated implementation within 12 months of contract award, system design and development activities actually required slightly more than 13 months. This delay had several causes. The review of PRC's deliverables (especially the Detailed System Design) required more time and effort than expected. Resolution of problems and issues raised during the Critical Design Review and the Functional Demonstration Test also required more time. PRC encountered longer lead times for hardware delivery than originally anticipated. Finally, the scope of the system expanded after contract award. Whereas PRC originally expected that up to about 80 retail outlets would be included in the demonstration, 110 had been enrolled by the end of Phase II. This expansion increased the number of retailer sites to be surveyed during Phase II and made planning for retailer training somewhat more time consuming.

Level of Effort for Developing the System

Phase II of the contract (System Development) lasted from January 24, 1984, to August 9, 1984, about six and one-half months. Staff from PRC and the various food stamp agencies worked a total of approximately 15.9 person-years during this period on development activities.

PRC staff spent about 13.1 person-years of effort. About 76 percent of this effort (approximately 10 person-years) focused on writing, testing, and integrating program code for system operations. Developing training plans and materials occupied about 11 percent of PRC's total effort, and program management required about 7 percent of the effort. The remaining 6 percent of the total time was spent on additional system engineering work, preparing for

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and conducting the Functional Demonstration Test, and preparing for a System Acceptance Test to be held at the beginning of Phase III.

For staffing, senior scientists contributed about six percent of PRC's total time commitment. Senior systems analysts contributed about 30 percent of the effort, and computer programmers and analysts contributed another 44 percent.

FNS staff from the national office spent nearly 0.9 person-years on demonstration activities. This time was split among review of final design, training, and implementation documents prepared by PRC; working with PRC, the state welfare department, and the local welfare office on outstanding design issues; and attending and evaluating the Functional Demonstration Test. National staff also prepared an Amended General Notice of the demonstration which was published in the Federal Register shortly after the end of Phase II, on August 21, 1984. This notice provided operational details about the demonstration which were unavailable at the time of the July 8, 1983, General Notice. Finally, FNS continued to meet biweekly with PRC throughout this period and started a series of periodic (monthly or bimonthly) management meetings in March with PRC, the FNS regional office, the state welfare department, and the Reading welfare office. These latter meetings worked to improve communication about the demonstration among these organizations.

FNS staff from the Mid-Atlantic Regional Office (MARO) spent about 0.4 person-years on demonstration activities. Much of this time was spent working with PRC on issues related to demonstration boundaries and to procedures for monitoring retailer enrollment. MARO staff also reviewed PRC's final documents and attended the Functional Demonstration Test. Finally, both regional and national office staff spent some time responding to growing interest from other states about EBT systems and the Reading demonstration.

Staff of the Pennsylvania Department of Public Welfare (PDPW) spent about 0.5 person-years during the development phase. They worked on establishing procedures for the preparation and communication of issuance data to the EBT system; supporting the local welfare office in distributing photo identification cards to demonstration recipients; preparing for PDPW's role in training demonstration recipients during Phase III; reviewing PRC documents;

and attending the Functional Demonstration Test and the periodic meetings with FNS and other agencies.

Staff at the BCAO spent about one person-year of effort. About 74 percent of this effort dealt with the distribution of photo identification cards to demonstration recipients. The remaining effort went to reorganize office space for the EBT workstation and its subsequent installation, to work with PDPW staff on plans for training demonstration recipients, and to attend the Functional Demonstration Test and the management meetings held by FNS.

3.4 SYSTEM IMPLEMENTATION - PHASE III

Implementation of the system began on August 9, 1984. This phase of activity lasted through January 31, 1985. January was the last month in which mass training of demonstration recipients occurred. (Formally, Phase III of the PRC contract lasts through the end of the demonstration. It does not distinguish between the implementation phase described here and the period of ongoing system operations.)

Testing the System

Although the EBT system's general design and operations had been tested during the Functional Demonstration Test held in July 1984, a second test of the system was held between August 24 and August 29. This System Acceptance Test examined the system's ability to perform all the functions for which it was designed. It served as a basis for FNS to accept PRC's work prior to system start-up.

In contrast to the earlier Functional Demonstration Test, the System Acceptance Test had all computer facilities for the EBT system located on-site in Reading. In preparation for the test, PRC established the EBT Center at AB&T and had the system's two IBM Series/1 computers and ancillary equipment reinstalled at the EBT Center. (The second office location for the EBT Center was not established until mid-September 1984.) PRC also equipped five retail stores with BTTs and printers so that the acceptance test could demonstrate the processing of transactions from multiple locations. Finally, the welfare office selected five food stamp recipients to participate in the test.

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The System Acceptance Test was more comprehensive than the Functional Demonstration Test. It demonstrated the following main functions:

- distribution of benefits to recipient accounts and initialization of retailer EBT accounts

- issuance and encoding of recipients' benefit cards

- exchange of food stamp benefits for food items at retail outlets

- maintenance of the EBT system's data base

- transmission of deposits through the ACH network to retailers' bank accounts

- system communications

- system backup and recovery in the event of system failure

FNS noted several problems and areas of concern during the System Acceptance Test. Among the most serious issues were the following: the test did not include delivery of a weekly reconciliation tape to the FNS Minneapolis Data Center; reconciliation of a manual purchase transaction was not successfully performed, and the electronic transmission of regular issuances from the state required considerable time. In addition, although the test included multiple purchase transactions from five different retail outlets over a short period, FNS desired further stress testing to indicate how well the system would perform under normal processing loads.

In response to these concerns, during September PRC and the Minneapolis Data Center successfully tested the production, delivery, and processing in Minneapolis of a weekly reconciliation tape. After discovery and correction of a minor programming error, PRC demonstrated the reconciliation of a manual purchase transaction shortly after the end of the System Acceptance Test. PRC had no immediate solution to the time required to process the issuance file from the state welfare department. It was decided to use physical delivery of tape files instead of electronic transmissions for regular issuances for the first several months of the demonstration.

With regard to additional stress testing, PRC temporarily modified a number of BTTs in the field in mid-September to simulate high transaction

loads on the system. Although the stress test eventually failed because of a programming error, the system handled all transactions up to the point of failure.

Preparing for Start-up

Two major implementation tasks occurred between the authorization of Phase III and the start of system operations on October 1, 1984. Nearly all retail outlets participating in the demonstration received EBT equipment, and several different groups (not including recipients) learned how to use the system.

Equipment Installation. Before retail outlets could be equipped with BTTs and printers, additional telephone lines and extensions of existing lines had to be installed at checkout counters. The telephone company began this task immediately after the start of Phase III. As the lines were installed, PRC field technicians operating out of the EBT Center began installing the BTTs and printers. Each BTT and printer installation took approximately two hours. Installation took about four hours when retailers requested that the BTTs be mounted on stands rather than placed on counters or registers. During installation, the technicians filled out forms listing the serial numbers of all equipment installed. Store owners signed these forms, which stated that the equipment was the property of USDA, and returned them to the technicians. The signed forms also bound retailers to USDA rules and regulations for the demonstration and contained information (e.g. store name and address, name of bank holding the retailer's account) necessary to establish accounts for the retailers in the ACH electronic funds transfer network.

Not all stores were equipped by the October 1 start-up date. The telephone company experienced some delays in installing lines, and PRC experienced delays receiving some mounting equipment. Nevertheless, PRC equipped 93 stores (including all participating stores in the four center-city ZIP codes) by October 1. An additional 17 stores were equipped by October 6. These 110 stores represented the original group of stores which had requested to participate in the demonstration and for which funds for equipment and installation had been authorized.

Because of problems in providing BTTs to all stores before start-up, PRC decided not to install the balance-only terminals until the rest of the equipment was completely in place. PRC installed these terminals during October and November.

Training for Non-recipients. During September, PRC conducted training sessions for all demonstration participants except food stamp recipients. Over 100 staff at the Berks County Assistance Office received varying amounts of training on system operations, depending upon their EBT-related responsibilities. Twenty staff members from the FNS regional and field offices were trained as facilitators to help retailers and recipients during system start-up in Reading. Volunteers from community agencies in Reading also trained to help recipients. To prepare for the training of recipients, PRC trained 35 employees of the state welfare department in how to conduct training sessions. For this latter training, PRC staff reviewed the lesson plans for recipient training and indicated which aspects of training should be emphasized. These aspects included practice sessions using the benefit cards and PINs and the importance to recipients of keeping their PINs a secret. The prospective trainers also saw the videotape prepared for recipient training.

PRC conducted training sessions for retail store owners, managers and clerks from September 11 through September 17. Up to 20 individuals attended each one-hour session, and eight sessions occurred each day at varying times to accommodate employee work schedules. Prior to the training sessions, PRC sent notices to all retailers enrolled in the demonstration informing them that the sessions would be held and asking them to call PRC to reserve space for their preferred time slots.

PRC trained about 800 owners, managers and clerks during this period. Training covered procedures to be followed in:

- signing the BTTs on and off the system

- processing EBT food purchase and refund transactions

- processing manual purchase transactions

- using the printed journal tapes to monitor food stamp sales and to reconcile these sales with subsequent deposits to retailers' bank accounts

- handling equipment problems and any problems which recipients might have with the system (such as forgetting their PIN or disagreeing with an "insufficient balance" message)

BTTs, PIN-pads and printers were used during the training to give the retailers hands-on experience with the equipment. In addition, PRC prepared special benefit cards for use during the training. Although the BTTs were not connected to the system during training sessions, PRC programmed them in a special "training mode" which allowed all BTT functions to be demonstrated. However, the absence of direct interaction with the system precluded identification during training of possible communication or system-related problems retailers might encounter during system operations.

According to a special survey of retailers conducted by Abt Associates as part of its evaluation of the Reading demonstration, about 58 percent of the participating stores opted not to incur the expense of sending all their clerks to PRC's training sessions. Instead, store managers and/or selected clerks came to the training sessions and then returned to train their remaining clerks. Most in-store training lasted 10 to 30 minutes (compared to PRC's hour-long training session). About 18 percent of the stores doing their own training, however, reported that the training lasted less than ten minutes.

PRC believes that the in-store training was not very successful. Many stores had not received their equipment by this time, so clerks did not receive any hands-on experience. Also, even for stores with equipment, no practice transactions could be accomplished without the special cards that PRC used during training. (Some retailers suggested that such cards be routinely provided to all retailers to facilitate the training of new employees and the retraining of other employees.)

Because retailers could not participate in the demonstration until they had received training, PRC scheduled make-up sessions on September 27 for retailers who had missed the regular training sessions. About 15 retail clerks and managers were trained during these sessions.

Beginning System Operations

In mid-September, with some acceptance test issues still unresolved and uncertainty that all demonstration stores would be equipped by October 1, FNS considered a one-month start-up delay. By September 21, however, PRC completed the stress test of the system and successfully tested the transmission of a weekly reconciliation tape to the Minneapolis Data Center. After receiving assurances from PRC that all stores in the four center-city ZIP code areas would be ready by October, FNS opted for the October 1 start-up date. As discussed earlier, nearly all of the demonstration stores were equipped by this date.

On October 1, 1984, the EBT Center began operations by receiving its first non-test transmission of issuance data (the October regular issuance) from the state welfare office. At the same time, state and local staff began training recipients. After training and card initialization, recipients could immediately use their cards in grocery stores to buy food. Over 190 EBT purchases totaling $1,812 were completed during the first day of operations.

Soon after the start of system operations, PRC realized that the EBT Center needed to be staffed nearly 24 hours each day to provide time to perform all system processing requirements. EBT Center staff provided the additional coverage, even though FNS did not authorize funds for 24-hour staffing until the following January. Initially, nine persons provided this coverage: one supervisor, three full-time system operators, two part-time system operators, and three field technicians. Except during shift changes, only one operator was needed per shift to operate the system. PRC hired one additional full-time operator in January.

During the first week of system operations, FNS facilitators visited each participating store in Reading and provided assistance as problems arose. Most problems were related to minor equipment malfunctions. Examples include loose power cords to the printers, jammed printer paper, and loose handsets on the BTTs. This last problem would cause other BTTs connected to the same telephone line to display a "Line Busy" message when attempting to dial the EBT Center.

After the first week of operations, a staff of three field technicians operating out of the EBT Center responded to all store problems. Retailers were instructed to call the EBT Center as problems occurred. In addition, PRC sent a letter to retailers on October 31 detailing the common problems which had occurred during the month and describing procedures the retailers could take to correct the problems without calling for assistance (e.g., checking all power cords and cables to be sure they were securely fastened to the equipment).

Training Recipients

The state and local agencies planned to train demonstration recipients in three waves during October, November and December. Two factors led to this schedule. First, program regulations require that recipients receive each regular monthly issuance within 35 days of their last regular issuance. To meet this regulation during the switchover from coupon issuance to EBT issuance, all EBT training sessions had to be held by about the ninth work day of the month. (In Berks County during this period, Authorization-to-Participate cards were issued on the fourth work day of each month.) Trying to train more than one-third of the demonstration caseload in this limited time would have required more trainers and training space than available. Second, phasing the caseload onto the system allowed PRC and FNS more time to monitor system operations and make necessary adjustments before the system reached peak loads.

Each wave of recipients received notices from the BCAO about two weeks prior to their scheduled training. The notices specified when each recipient was supposed to come and that it would be necessary for recipients to bring their photo identification cards to the office. The notices also indicated that recipients had to attend a training session to remain eligible for assistance.

Training Sessions. Training sessions lasted about one hour. Depending on which of two training rooms was being used, from 15 to 30 recipients were trained during each session. After a general introduction to the EBT demonstration project, recipients saw the first portion of the videotape describing how they would purchase groceries under the new system. Recipients

then selected their PINs and wrote them on slips of paper. BCAO staff carried these slips of paper and the recipients' photo identification cards to the workstation for encoding. While the cards were being encoded, recipients watched the remainder of the videotape. After the videotape presentation, the recipients received their encoded cards (BICs), and they spent the remaining 15 to 20 minutes of the training session using their BICs with several BTTs installed in the training rooms. During this time, recipients practiced entering their PINs and obtaining account balances. Typically, four staff members answered questions and helped recipients during this period.

Material distributed during the training sessions included manuals describing how to use the BIC and plastic holders designed to hold the recipient's BIC and EBT receipts. There also was a children's flyer telling children how to purchase groceries using their parent's BIC, PIN, and the Alternate Shopper Card. Both the training session and the flyer stressed the importance of keeping the PIN a secret.

At the conclusion of each training session, recipients could immediately use their BICs to purchase groceries at any participating retail store.

Training Schedule. The first wave of about 1,630 recipients was trained during October 1-12. About 140 recipients scheduled for the October training sessions did not appear for training. Make-up sessions were held on October 19, when another 44 recipients were trained. The second wave of about 890 recipients was trained during November 1-9. An additional 67 recipients were trained at make-up sessions held November 16.

Training for the third and final wave of recipients was planned for December. FNS postponed this training until January after a number of problems with the system became apparent in November. The postponement gave PRC more time to correct the problems before the system had to operate at full capacity.

The third wave of 908 recipients was trained during January 3-11. This wave included most Spanish-speaking recipients in the demonstration and all recipients known to have mental, emotional, or physical handicaps. The special training needs of handicapped recipients were met by smaller training sessions and more assistance during recipients' practice sessions.

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An additional 98 recipients were trained during make-up sessions on January 23 and 24. With the completion of this last wave of training, 3,632 recipients had been trained during the four-month implementation period. Approximately 360 recipients failed to appear for either a regularly scheduled training session or a make-up session. About 150 of these recipients had their food stamp cases closed as a result. The remaining recipients either had moved out of the demonstration area or had had their cases closed for other reasons.

After this mass training effort, the Berks County Assistance Office assumed responsibility for the training of new recipients. Beginning in February, training sessions occurred on Wednesday and Friday mornings of each week.

Revising System Operations during Implementation

Processing Time and System Slowdowns. By the end of October, PRC realized that the system did not process data as quickly as expected. In particular, activities requiring batch processing (such as updating the data base with issued benefits, daily bundle-up of retailers' deposit information, and daily system reconciliation) consumed long periods of time and slowed the processing of transaction messages coming from terminals in the stores. Delays in processing these transaction messages forced retailers to wait for confirmation of the transaction before completing the sale. These delays usually occurred in late afternoon, when peak shopping hours coincided with processing requirements for the daily bundle-up of retailers' deposits. On some occasions, the system slowed to the extent that additional transactions could not be processed (store BTTs were programmed to cancel any transaction request if the transaction was not processed by the system within one minute).

The problems with processing speeds and system slowdowns continued into November. In addition, hardware and software problems caused the system to "crash" several times in November, resulting in 13.5 hours of downtime during the month. The hardware problems included failure of the system's chronograph and of the primary computer's control panel and processor board. Conversion errors (the introduction of alphabetic characters in numeric fields in messages from store terminals to the system) also caused system crashes.

Finally, although it had no effect on system downtime, problems occurred in the Voice Input/Output (VIO) unit which responds to balance inquiries over regular touch-tone telephones. Recipients calling the special number for the VIO unit regularly encountered busy signals.

The level of system usage in October and November also suggested that the system might have additional peak-load problems after all demonstration households were converted to the EBT issuance system. PRC designed the EBT system to accommodate up to 20,000 purchase transactions each month (an average of five transactions for each of 4,000 demonstration households). Households already on the system, however, averaged nearly eight purchases per month in October and November. Furthermore, as discussed more fully in Chapter 4, households concentrated their purchases in afternoon hours on the days immediately following issuance.

The unexpected usage levels had two impacts. First, the high peak loads in the afternoons contributed to the slowdowns. Second, once all recipients were added to the system after the last wave of mass training, PRC was concerned that the file capacity of the system's database might be exceeded. Some uncertainty existed over the magnitude of this latter problem because file usage also is affected by non-purchase activities like refunds, balance inquiries, and card encoding. Without these latter activities, the system could accommodate an average of ten purchase transactions per recipient each month.

Responding to the Problems. FNS and PRC met several times during November to discuss these problems. PRC developed both short-term and long-term plans for improving processing speeds. Proposed short-term actions included negotiating with AB&T for a later deadline each day for delivery of retailers' deposit information (to allow bundle-up to be performed after the afternoon peak shopping hours), decoupling the system's two computers (which would increase transaction speeds but increase downtime if the primary computer failed), and formalizing 24-hour operation of the EBT Center (to continue providing needed time for batch processing jobs). Proposed long-term actions included upgrading the computer hardware and modifying the system's software to improve processing speed. No proposals were made at this time for increasing the system's file capacity.

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Few of PRC's recommendations could be implemented immediately, and FNS needed time to evaluate each recommendation in terms of its likely impact on system operations and contract costs. Accordingly, on November 23, FNS postponed until January the scheduled December training of recipients. This action delayed any increase in system use and avoided compounding the existing difficulties.

Continuing Issues. The system continued to experience slowdowns and other problems in December. The system was down about five and a half hours during the month. Two of these hours were for planned late-night repairs of the Voice Input/Output unit by IBM. The remaining down time resulted from conversion error problems, difficulties restarting the system after the IBM repair work, and problems with bad tapes. To reduce system slowdowns during bundle-up, PRC occasionally decoupled the system's two computers. This action increased processing speeds by eliminating the need to simultaneously update both computers' databases.

The system was down for about two and a half hours in January. Part of the downtime resulted from conversion error problems. The remainder occurred while IBM worked on a faulty tape drive. In addition, one new problem occurred. File space on the EBT Master File was exceeded during the regular monthly posting of benefits. Although PRC corrected this problem by reorganizing the file, several bundle-ups of retailer deposits were missed while this reorganization occurred. These deposits were credited to retailers' accounts at a later date.

Several actions were taken in January in response to the problems noted above. To reduce afternoon loads on the system, recipients attending afternoon training sessions had their cards encoded later that might (during off-peak hours). They returned the next morning to pick up their cards. PRC also decoupled the system's two computers during most of the month to increase processing speeds. Near the end of the month, FNS authorized funds for 24-hour staffing of the EBT Center. Finally, PRC modified the store terminals at the end of January to eliminate most of the conversion error problems.

The end of January 1985 saw the end of the mass training of recipients and of the system implementation period (as defined for this report).

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FNS instructed PRC to operate the system in a dual-CPU configuration to provide continuous backup capability. The two computers were to be decoupled to improve transaction speeds only when the system began to experience severe slowdowns. FNS also hired a technical consultant to assist in its evaluation of system operations and PRC's further recommendations for system improvements.

Revising System Operations after Implementation

The EBT system continued to experience slowdowns, system crashes, and some periods of inaccessibility to retailers for several months after the end of January. Some of the problems were caused by hardware failure. For example, a faulty diskette reader caused the system to crash several times in February, leading to two and a half hours of downtime while the problem was diagnosed and corrected.

Other problems were associated with software error. Measured by its consequences for system operations, the worst software problem occurred in March. On the morning of March 5, a software error delayed reconciliation processing. This delay, in turn, delayed the update of the March issuance of regular benefits. When recipients tried to access their March benefits that morning, they discovered that they did not yet have sufficient funds to cover their intended purchases. Long lines at checkout counters resulted.

Finally, operator errors occasionally led to system slowdowns. Examples include forgetting to replace backup diskettes prior to peak sales periods (which then slows the system when the diskettes need to be replaced during peak hours) and using a 12-hour clock rather than a 24-hour clock to reset the system.

FNS and its technical consultant reviewed PRC's proposed system modifications to improve system operations during this period. Although FNS has not authorized any major modifications, it approved several changes. PRC rewrote some software to increase the speed of transaction processing and modified BTTs in the five busiest stores so they would wait three minutes (rather than one minute) before cancelling a transaction request. This latter change reduced slowdown problems by reducing the system's need to back out transactions which were cancelled before they were completed. FNS also authorized

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PRC to add a 200 megabyte cache disk to hold the system's Master File and History File. The additional disk space improved system efficiency by reducing multiple access to existing disk space for database records and system software code.

Other changes included the addition of a seventh telephone line to the system's computers to handle transaction messages and a rescheduling of retailer bundle-up from late afternoon. The additional phone line reduced the number of times BTTs encountered busy signals when attempting to call the EBT Center. The shift in bundle-up time reduced competing demands on the system during late afternoon peak shopping periods.

To avoid a repetition of the problems with the March issuance, FNS and the state welfare department authorized PRC to post regular monthly issuances to recipients' accounts on the weekend prior to the fourth work day of the month. This procedure continued until July 1985. At that time, a staggered issuance system was implemented to reduce peak shopping loads. The staggered issuance schedule called for issuances on the fourth and ninth working day of each month.

Level of Effort for System Implementation

System implementation lasted from August 9, 1984, to January 31, 1985. During this nearly six-month-long period, staff from PRC and the various food stamp agencies spent a total of about 9.5 person-years on demonstration activities.

PRC staff spent 5.8 person-years during this period on EBT-related tasks. These included installing equipment in stores and at the EBT Center, conducting the System Acceptance Test, training all participants except recipients, and staffing the EBT Center for four months. The time also included PRC's identification of system problems and subsequent efforts to correct them.

FNS staff from the national office spent about one person-year on demonstration activities during this six-month period. This included site visits to Reading during the acceptance test and the first week of system operations. Thereafter, FNS staff monitored system operations for several

days at the beginning of each month when recipients received their monthly issuances. The remainder of the time was spent meeting with PRC staff to discuss system problems and reviewing PRC's proposals to improve system operations.

FNS staff from the Mid-Atlantic Regional Office and its Philadelphia field office spent about 0.7 person-years on system implementation activities. Although MARO staff attended the acceptance test, most of the effort during this period (about 76 percent) involved being trained and acting as facilitators during system start-up.

Staff from the state welfare department spent about 0.6 person-years on demonstration activities during system implementation. Their major activity (approximately 50 percent) was training recipients to use the system; the other major activities were attending the acceptance test, handling and reconciling issuances, and participating in discussions about the system with PRC and FNS.

Finally, staff of the Berks County Assistance Office spent about 1.4 person-years during this period. Nearly 80 percent of this total effort involved recipient training and the encoding of recipients' benefit cards.

Level of Effort Through Project Implementation

Excluding the time spent preparing the solicitation for the EBT demonstration (about 1.2 person-years), a total of about 30 person-years was required to design, develop, and implement the Reading EBT system. This effort was performed over the 17-month period extending from July 1983 through January 1985. As would be expected, the system contractor put in most of the effort (about 22.1 person-years, or 74 percent of the total). Significant amounts of time, however, also came from FNS staff and state and local employees of the Pennsylvania Department of Public Welfare. FNS staff from the national, regional and field offices spent a total of 3.9 person-years working on the EBT project. PDPW staff spent about 3.7 person-years on the project.

CHAPTER 4

FUNCTIONAL AND SPECIAL REQUIREMENTS FOR SYSTEM DESIGN

Chapter Four

FUNCTIONAL AND SPECIAL REQUIREMENTS FOR SYSTEM DESIGN

The first step in designing an electronic benefit transfer system is to specify what the system must do. These system requirements should cover all of the primary functions the system must perform, including interfacing with existing program operations. In addition, a variety of special issues and objectives may need to be incorporated into system requirements. For the Reading EBT demonstration, these special objectives included not disrupting recipients' established shopping patterns and accommodating food stamp households leaving the demonstration area.

With the functional and special requirements established, decisions can be made about hardware components, software alternatives, and overall system configuration. At this point, if the sponsoring agency plans to hire a contractor to develop and implement the system, it must make a strategic choice. The agency may specify only the functional and special requirements of the system, leaving major design decisions to the contractor. Alternatively, the agency may specify some design elements as well, thus requiring the contractor to develop a system with these features. For example, the agency might require the use of an on-line system, an off-line system, or particular hardware components.

For the Reading demonstration, FNS chose to specify only functional and special requirements. Prospective contractors chose basic system designs and presented them in their proposals. In a rapidly changing technological environment, this strategy allows the agency to select among a variety of designs, while leaving the contractor with flexibility to select the most efficient and effective components from those available.

This chapter discusses the functional and special design objectives that FNS presented in its EBT system solicitation (see Request for Proposals #82-185KH, dated January 10, 1983). It also describes the approach taken by the contractor, Planning Research Corporation, to meet these requirements. Where appropriate, operating statistics from the Reading demonstration are included to provide some basis for future refinement of design requirements.

The first four sections in this chapter deal with the functional requirements that FNS specified for the EBT system. These requirements fall under the general categories of benefit authorization, delivery, redemption, and reconciliation. The fifth section deals with other general system objectives. Although these requirements and objectives apply to a range of electronic fund transfer technologies, only the on-line system approach is explicitly considered here. The sixth section discusses requirements for reviewing system design.

4.1   REQUIREMENTS RELATED TO BENEFIT AUTHORIZATION AND ISSUANCE

Food Stamp Household Records and Issuance Files Must be Maintained

State food stamp authorities must maintain master Household Issuance Record (HIR) data and a current Issuance Authorization file for all food stamp recipients. These nationally mandated records must be maintained with any issuance procedure. An EBT system might change the location or procedures for maintaining these files, but need not necessarily do so.

Reading System. Although the Reading EBT system creates and maintains a number of special recipient files necessary for EBT operations, it does not affect the files described above. The Pennsylvania Department of Public Welfare (PDPW) uses a single Food Stamp Master File to record all household authorization and issuance information, and it retains this responsibility in the demonstration. The only change in procedures has been to identify which households on the file are participating in the demonstration.

The Delivery of Benefits to Households Must be Authorized

The Food Stamp Program requires the state to implement procedures to deliver benefits to recipients. These procedures include certification of household eligibility for the Food Stamp Program, calculation of benefit levels, and--in areas using Authorization-to-Participate cards--the printing and distribution of ATPs.

In Pennsylvania, county assistance staff obtain information on household financial circumstances from Food Stamp Program applicants and determine their eligibility. The local office conveys this information to the PDPW. The state agency confirms household eligibility, calculates benefit

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allotment levels, and adds this information to the Food Stamp Master File. After determining benefit levels, the state's computer system uses the Master File to create a tape of scheduled ATPs to be printed and mailed. Currently, regular monthly ATPs for households in Berks County are mailed on the fourth and ninth work days of each month. For the first nine months of the demonstration, all regular monthly ATPS were mailed on the fourth work day of each month. County assistance offices manually process expedited, supplemental, and prorated ATPs, and the State's Master File is subsequently updated to include this information.

Reading System. Although the Reading EBT system does not interfere with the state's existing procedures for certifying household eligibility or calculating benefit levels, the EBT system eliminates the printing and distribution of ATPs.

Before the state's Master File is used to print ATPs, household records for demonstration recipients are extracted to a separate file. The state transmits this file to the EBT Center, where issuance amounts are credited to recipients' accounts on the EBT Center's Master File. The state writes regular monthly issuances on computer tape and sends the tapes by courier from Harrisburg to the EBT Center in Reading. In contrast, expedited, supplemental, and prorated issuances are transmitted electronically to the EBT Center daily.

The Reading EBT system had its first full month of operation with the complete demonstration caseload in February 1985. In that month, the system held 3,377 active cases (cases whose benefit cards had been encoded and who received benefits during the month). The EBT Center added benefits to 95 percent of these accounts during the regular monthly issuance on February 4. Some cases opened for the first time and received their first food stamp allotment later in the month. Some cases received supplemental or retroactive allotments. Thus, the EBT Center handled a total of 3,487 issuance transactions for the 3,377 cases, a ratio of 1.03. EBT systems in other locations might experience different ratios, depending on the frequency of supplemental and retroactive issuances.

In addition to these active cases, the EBT system contained records for 346 "pending" cases in February. Most of these cases were for individuals

who had never come to the welfare office to have their card encoded. The EBT system handled 124 issuance transactions for the pending accounts.

The EBT System Must Establish Recipient Accounts and Issue Benefit Cards

An EBT system requires a computerized account for each food stamp household. Each household also needs a benefit card or other access device. Procedures for initializing accounts and cards should be designed to prevent unauthorized access to food stamp benefits. These procedures will be carried out at least once for each case transferred from the coupon system to the EBT system and once for each new case opened under the EBT system.

With an off-line EBT system, benefit cards must be periodically reissued or updated to reflect each month's authorized benefits. On line systems do not require that benefit cards be reissued (except for lost, stolen, or damaged cards). However, an on-line EBT system design could include periodic card reissuance--e.g., at recertification--to increase system security. Printing an expiration date on each card or encoding a date on its magnetic stripe would reduce opportunities for fraudulent use of the card.

Reading System. The Reading EBT system establishes recipient accounts when the state welfare department transmits issuance data to the EBT Center. When the EBT Center receives an issuance for a household not already listed on the EBT Master File, a new account is automatically created. New accounts remain "pending" until a benefit card for the household is initialized at the welfare office (at which time the status is changed to "active"). Recipients cannot access benefits in pending accounts.

Each demonstration household in Reading receives a single benefit card that is valid until the end of the demonstration. Cards are reissued only when recipients report their cards lost, stolen, or damaged. Less than one percent of recipients need their cards reissued each month. Recipients report about 18 lost cards each month in Reading, and about three stolen cards. On average, about 10 cards need to be replaced each month when their magnetic stripes become so damaged that they can no longer be used in store terminals.

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Recipients also receive an Alternate Shopper Card. This card, when used in conjunction with a recipient's benefit card and PIN, allows other people to use benefits in the recipient's EBT account. Most retailers report that Alternate Shopper Cards are used for 5 percent or fewer of all EBT purchases.

Non-encoded benefit cards were distributed to demonstration recipients prior to system start-up. The early distribution was designed to expedite the process of initializing cards and training recipients after start-up. Recipients obtained their Alternate Shopper Cards during training sessions.

Card Issuance Must be Controlled

To ensure security, an EBT system must be designed to keep the authorization of benefits and the issuance of benefit cards separate.

Reading System. Income maintenance workers at the welfare office initiate benefit authorization when they certify a household's eligibility for the Food Stamp Program. Clerks at the office control card issuance. They distribute photo identification cards and encode information on each card's magnetic stripe. Thus, no single employee or administrative unit both authorizes and provides access to food stamp benefits. Additional control is provided by requiring clerks to enter their employee number at the EBT workstation when they initialize a recipient's card.

Expedited Service Must be Provided when Necessary

Program regulations require that households demonstrating an immediate need for assistance receive benefits within five days. An EBT system must be able to meet this requirement.

Reading System. During the October-January implementation period, applicants eligible for expedited service received initial benefits under the coupon issuance system. Since that time, demonstration households eligible for expedited service receive EBT benefits within two days of initial application. When they apply for benefits, a photograph is taken and a card is prepared. The Berks County Assistance Office transmits the authorization for benefits to the state welfare department that day, and the state calculates

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the benefit allotment. At 6:00 AM the following day, the state transmits a household record to the EBT Center. This record sets up the household's EBT account. The recipient then returns to the BCAO to have his or her card encoded. With an encoded card, the recipient may access his or her benefits at any participating retail outlet.

4.2 REQUIREMENTS RELATED TO DELIVERY OF BENEFITS

The System Must Verify Recipients' Identify

An Authorization-to-Participate system verifies recipients' identities when they redeem their ATPs for coupons at an issuance office. Recipients sign their ATP cards at the issuance office, and these signatures are compared to the signatures on their food stamp identification cards. In areas using photo identification cards instead of regular paper identification cards, the recipient's photograph also may be checked.

Retailers may require presentation of the food stamp identification card before accepting coupons if they suspect that the client is not an authorized food stamp recipient. To curtail the use of stolen or lost coupons, retailers cannot accept any loose coupons already torn out of their booklets, except loose $1 coupons.

With the elimination of ATPs, an EBT system must verify recipients' identities at the time of purchase. To prevent backups at checkout counters, however, the verification procedures should not be overly time consuming. Furthermore, the procedures should be designed to minimize retailers' verification responsibilities.

Reading System. The primary verification procedure in the Reading EBT system revolves around the recipient's Personal Identification Number. The PIN must be entered correctly for every purchase or balance inquiry. As described in Chapter 2, the Benefit Transaction Terminal (BTT) performs this verification check after the recipient's benefit card passes through the terminal's card reader and the recipient enters his or her PIN on the attached PIN-pad. The system performs a second PIN verification when either a purchase transaction or a balance inquiry message comes to the EBT Center. This second check is needed because store BTTs cannot identify lost or stolen cards.

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In addition to the PIN check, retailers may check the photograph on the recipient's BIC if they suspect the client is not an authorized food stamp recipient. If someone other that the recipient uses the BIC, an Alternate Shopper Card must be presented. Store observations indicate, however, that retailers do not consistently check the identification.

Prior to system implementation, some concern arose that recipients might have difficulty remembering or entering their PIN prior to purchase and balance inquiries. Surveys of recipients and retailers, however, indicate that this has not been a major problem. Only 7 percent of a sample of 279 demonstration recipients said that they ever forgot their PIN. Interviews with retailers found only 11 percent saying that recipients forgetting PINs had been a problem.

The relative infrequency of "incorrect PIN" messages transmitted to the EBT Center confirm these impressions. These messages are sent only after three consecutive incorrect entries with a single card. Only 227 such messages came during the four-month start-up period, the period in which recipients were learning the system. Less than 3 percent of the caseload had difficulties with the PIN in February 1985, and less than 0.5 percent of all purchases involved this problem.

The EBT System Must Allow Recipients to Use Benefits at Authorized Retail Outlets

An EBT system must carry out several functions related to benefit use at retail outlets. The system must verify that the retail outlet is authorized to conduct EBT transactions and that the recipient has a valid account with sufficient benefits to cover the intended purchase. When a client makes a purchase, this information must be transmitted to the system. Because retail clerks may make mistakes when entering the purchase amount, the system must provide a means for correcting these mistakes. Finally, the system needs a backup mechanism in order to allow transactions in the event of any system malfunction.

Reading System. The Reading EBT system verifies retailer authorization to participate in several ways. First, EBT Center field technicians install the EBT equipment only in those stores authorized by FNS, and the

system's Master File establishes accounts only for authorized retailers. Second, each BTT has an internally stored identification number. Every transmission to the EBT Center automatically includes this number. If a transmission contains an invalid identification number, the system will not process the transaction.

In addition, each store manager receives a store card, which is similar to a recipient's benefit card. At the start of each clerk's shift, the manager must pass the store card through the BTT's card reader and enter the store's PIN. The clerk enters his or her two-digit identification code. Until they complete this sign-on procedure no transactions can be processed through the BTT. If a store's authorization has been suspended or terminated, the EBT system will not process the sign-on.

Once a recipient has correctly entered his or her PIN, the checkout clerk enters the sale amount on the BTT. The EBT Center's computer checks the recipient's account record to verify that a valid account exists. If the recipient has reported the BIC as lost or stolen, or if the account has been placed on hold for some other administrative reason, the system prohibits any transactions. Otherwise, the system compares the purchase amount with the recipient's balance. If the balance exceeds the purchase amount, the transaction goes through. An approved purchase is immediately debited from the recipient's account. This process makes it nearly impossible to overdraw a recipient's account.[1]

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[1]An overdraft of a recipient's account can occur only when the system is down and a manual sale is authorized, and then only under a particular set of circumstances. As discussed in Chapter 2, the EBT Center operator checks the previous day's listing of recipient account balances before authorizing the sale. If the recipient has made an EBT purchase since the generation of the above report, the recipient's actual remaining balance will be less than shown on the report. Depending on the size of the true remaining balance and the manual sale, an overdraft may occur.

Overdrafts also may occur during manual sales if the store clerk or the operator at the EBT Center makes an error when handling the sale. For example, suppose a recipient with a balance of $25 in his or her account attempts a $27 purchase when the system is down. If the store clerk marks $27 on the manual sales slip, but incorrectly tells the operator the sale is for $23, the account will be overdrawn when the EBT Center receives its copy of the sales slip and attempts to reconcile the $27 purchase with the $23 temporary debit placed against the recipient's account. Alternatively, the same situation could occur if the clerk tells the operator that the sale is for $27, but the operator misunderstands and thinks the sale is for $23.

Corrections can be made when a clerk enters a wrong purchase amount. If the transmitted amount is less than the actual purchase price, the clerk can simply process a second transaction for the difference. If an overring occurs, the store can make a refund to the recipient's account. This requires the manager's authorization, which means the store card and PIN must be entered. The refund credits the recipient's account and debits the store's account.

Finally, if the EBT system is down, recipients may purchase up to $35 worth of groceries each day. This requires verbal authorization from the EBT Center for a manual transaction. Procedures for handling manual purchase authorization vary somewhat depending on the cause of the system failure, as described in Chapter 2.

Benefit Usage in the Reading System. To ensure that a system will be able to process recipients' purchase transactions, its designers must make assumptions about how often purchases will occur, and when and how often other transactions will require system processing. These assumptions determine the capacity needed by the system's hardware and its transaction files. They also will affect expectations about processing speed for a specified hardware and software configuration.

Experience from the demonstration indicates that the assumptions about benefit usage made in the Reading project were too low. Exhibit 4.1 presents statistics on patterns of regular benefit usage during February 1985, the first full month of normal operations for the Reading EBT system. Prior to February, only part of the Reading food stamp caseload used the system (from October through December), or households were still being trained (in January).

As shown in Exhibit 4.1, 3,377 "open" cases existed in the demonstration in February 1985. (An open case is a household which received benefits during the month and which had an encoded benefit card.) These cases made 23,537 regular EBT purchases totaling $363,091 during the month. The

Exhibit 4.1

REGULAR BENEFIT USAGE IN FEBRUARY 1985

Number of open cases[a]......................................3,377

Number of regular purchases[b].............................23,537

Total value of regular purchases........................$363,091

Average number of purchases per case.........................7.0

Percentage of cases with:
       0 purchases...4.5
       1 purchase...13.3
       2 purchases..11.0
       3 purchases..10.1
       4-5 purchases..15.1
       6-10 purchases...24.1
       11-20 purchases..17.0
       more than 20 purchases..................................4.9

Average value of a purchase...............................$15.43

Percentage of purchases with a value of:
       less than $1.00...6.5
       $1.01 to $2.00..10.9
       $2.01 to $5.00..28.6
       $5.01 to $10.00.......................................21.5
       $10.01 to $20.00......................................13.9
       $20.01 to $50.00......................................10.3
       $50.01 to $100.00......................................5.7
       more than $100...2.6

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[a]Defined as households which were issued benefits in February and which had activated EBT accounts (i.e., had been trained and had their EBT cards encoded).
[b]Excludes manually authorized transactions and purchases of AIPs.

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average household made seven purchases, and the average purchase amount was $15.43.[1]

Patterns of benefit usage varied substantially among these households. Nearly 5 percent of the households made no regular EBT food purchases during February. Over 20 percent made only one or two purchases. However, 17 percent of the households made between 11 and 20 purchases during the month, and nearly 5 percent made more than 20 purchases.

The number of purchases was surprisingly large. Prior to the demonstration, retailers' anecdotes suggested that most recipients spend their entire monthly allotment in one or two purchases. In a survey of recipients conducted before the demonstration, 58 percent said they shop with food stamps just once a month, and only 8 percent said they shop more often than once a week. Clearly, recipients make more separate purchases with food stamps than either the recipients or the retailers realize.

Many of the recipients' purchases were quite small—nearly half totaled less than $5. Over 17 percent of the purchases were for $2 or less, and about 29 percent ranged between $2 and $5. Only 8 percent of all purchases exceeded $50, although the average case received an allotment of $111.

The peak volume of purchases occurred in the afternoon of the days immediately following issuance. Benefits were added to recipients' accounts on Monday, February 4. Recipients made at least 190 purchases per hour between 3:00 and 6:00 PM on Tuesday, between 2:00 and 6:00 P.M. on Wednesday, and between 4:00 and 6:00 P.M. on Thursday. The peak occurred between 5:00 and 6:00 PM on Wednesday, February 6: 284 purchases were made, representing 1.2 percent of all EBT purchases for the month.

After the issuance peak, the number of purchases declined throughout the month. Recipients made 2,207 purchases on Wednesday, February 6. One week later, on February 13, they made 1,178 purchases. The total dropped to 628 on February 20 and to 428 on February 27. Exhibit 4.2 illustrates this pattern.

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[1] Prior to February, demonstration households averaged about eight purchases each month.

Exhibit 4.2
Daily Volume of Purchase Transactions

Day of Month
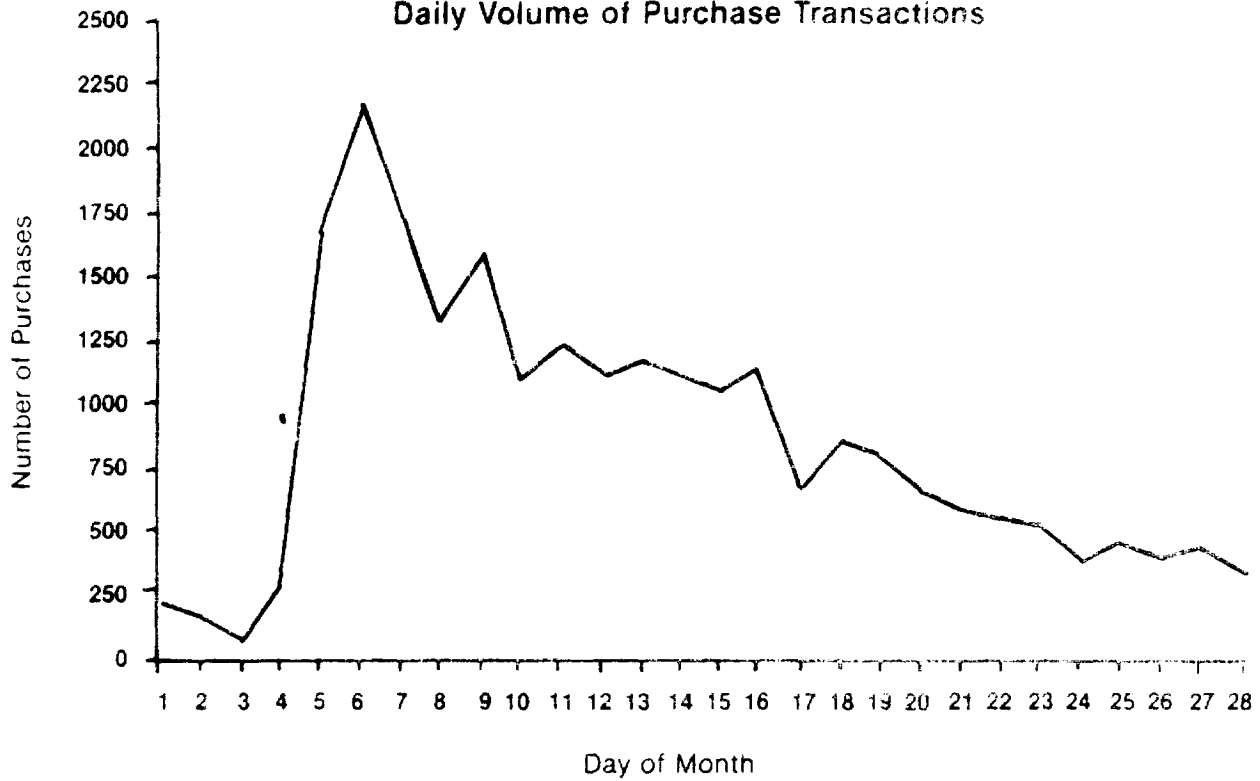
Exhibit 4.3
Hourly Volume of Purchase Transactions

Time of Day
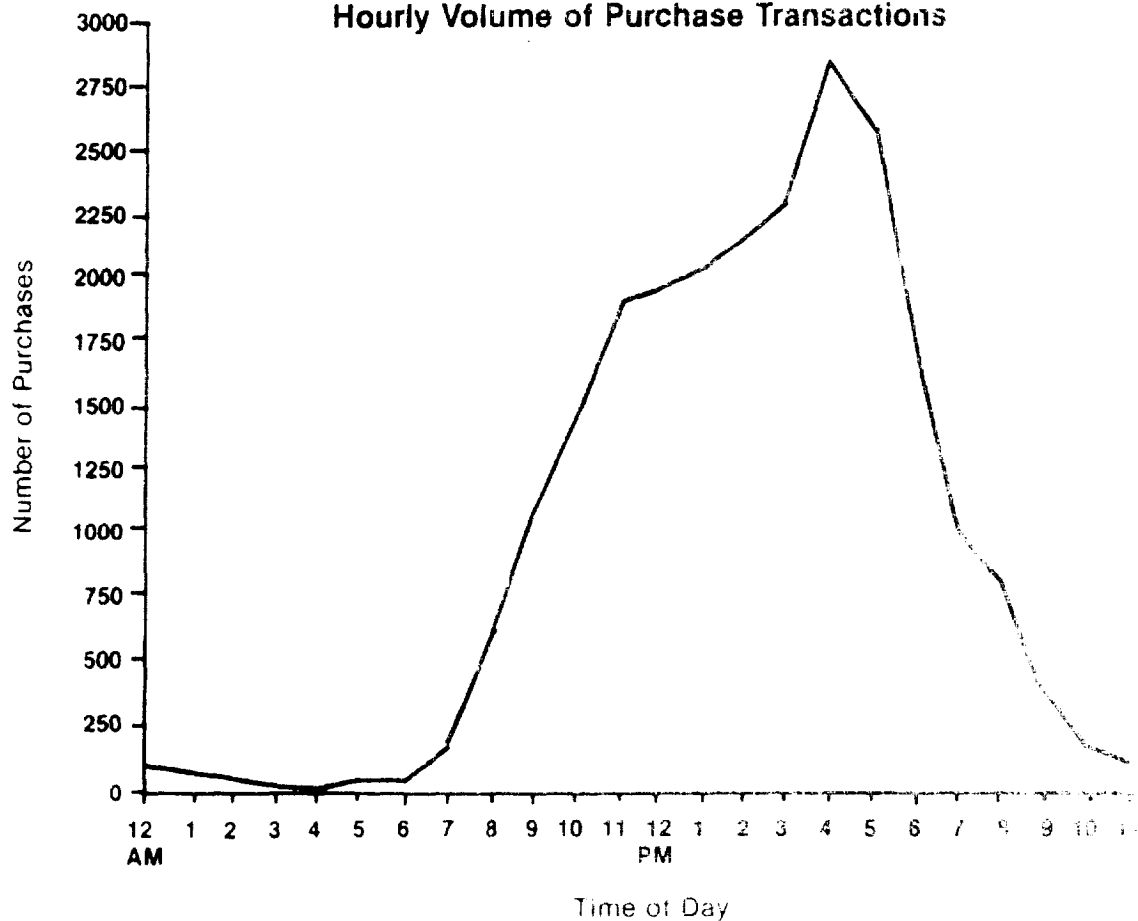
Note. Figures refle t electronic purchases (manual purchases are excluded   in February 1985.

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Throughout the month, recipients made most of their purchases in the afternoon hours, as shown in Exhibit 4.3. Few purchases were made between 9:00 PM and 9:00 AM. Only 7 percent of all purchases for the month occurred during these hours.

Despite the large number of purchases, some recipients did not spend all of their benefits during the month. The EBT Center placed a total of $375,769 in food stamp benefits in the accounts of the 3,377 open cases in February. These recipients spent a total of $367,326 during the month, or about 98 percent of the benefits issued.

Non-routine Transactions. In addition to routine purchases, an EBT system must be capable of handling and processing non-routine transactions. Exhibit 4.4 presents statistics on the incidence of non-routine transactions in the Reading EBT system during February.

Manually authorized purchases are needed when store equipment breaks down or when the system itself cannot process regular purchase transactions. There were 119 manually authorized purchases in February. These represented 0.5 percent of all purchases made by household during the month.

The incidence of manual purchase transactions is directly related to the incidence of system and equipment problems. Figures for a single month, therefore, may not be representative of the normal incidence of manually authorized purchases. For the four-month period preceding February, the incidence of manual purchases (as a percentage of all purchases) ranged from 0.2 percent in January to 0.9 percent in November.

The above figures for the incidence of manually authorized purchases underestimate the percent of all attempted purchases which cannot be routinely processed by the EBT system. Some stores and recipients choose not to request manual sales authorizations even when the system is down. As discussed in Chapter 7, retailers find manual sales procedures to be cumbersome, and during peak shopping hours it is sometimes difficult to get through to the EBT Center to request an authorization. Thus, when the system is down, some retailers ask recipients to wait until the system is operating or to come back at a later time. The frequency of attempted purchases which are not completed is not measured in any available data.

Exhibit 4.4

NON-ROUTINE TRANSACTIONS IN FEBRUARY 1985

Number of open cases[a]..3,377

Number of regular purchases[b]..23,537

Number of manually authorized purchases.......................................119

   Manually authorized purchases as a percent of all purchases.....0.5%

Number of refunds...240

   Refunds as a percent of all purchases............................1.0%

Number of cases in which recipient had insufficient balance[c].......926

   Incidents of insufficient balance as a percent of all
   purchases...3.9%

   Percent of open cases with one or more insufficient
   balance incidents..23.3%

Number of purchases of ATPs[c]..10

   Percent of open cases with an ATP purchase.......................0.3%

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    [a]Defined as households which were issued benefits in February and which had activated EBT accounts (i.e., had been trained and had their EBT cards encoded).

    [b]Excludes manually authorized transactions and purchases of ATPs.

    [c]An insufficient balance message could result from an error in ringing up the amount of purchase.

Refund transactions are required when recipients return merchandise or when store clerks make a mistake and transmit a purchase amount greater than the actual purchase value. In addition, when the system cannot complete a purchase transaction within one minute, the purchase amount debited against the recipient's account is automatically backed out of the system's database.[1] This backout is recorded as a refund to the recipient's account, even though no refund actually took place. These three situations cannot be easily distinguished in the available data. In total, however, the system processed 240 refund transactions during February. This volume represented about 1 percent of all purchase transactions. The incidence of refund transactions for the four months preceeding February ranged from 0.9 to 1.5 percent of all purchase transactions.

Purchases cannot be completed when the recipient's remaining balance is less than the value of the attempted purchase. Again, two different situations can cause a purchase attempt to be rejected by the system for insufficient balance. The recipient actually may not have sufficient funds to pay for all items brought to the checkout counter, or a store clerk may err and enter a purchase amount which exceeds both the actual purchase amount and the recipient's remaining balance.

There were 926 instances in February in which the purchase amount transmitted to the system exceeded the recipient's remaining balance. These instances represented 3.9 percent of all successful purchase transactions. About 23 percent of the households experienced at least one such incident.

Examination of the insufficient balance records suggests that most incidents were actual attempts to buy more groceries than could be paid for with the recipient's remaining EBT benefits. The problems typically occurred when the recipient had almost exhausted the month's benefits. The insufficiency was generally very small, often less than $1. These rejected transactions were usually followed by a successful purchase for a lesser amount. Apparently the recipients knew that the balance in their benefit

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[1]The one-minute "timeout" period is programmed into store terminals. In March, PRC modified 30 terminals in the five busiest stores to extend their timeout period from one minute to three minutes. This modification reduced the number of transactions which could not be processed by the system within the programmed timeout period.

account was low, and they planned to empty the account with a final purchase. However, they slightly miscalculated the value of the items they had chosen and had to exclude some from the purchase.

The second most common pattern of insufficient balances involved attempted purchases occurring in the days just before February's regular issuance. Successful transactions usually did not follow these rejections, suggesting that they occurred because the recipients were uncertain about whether or not benefits had yet been issued.

The records did not indicate a pattern of recipient inability to keep track of the food stamp balance. A group of cases with multiple insufficient balance records was examined in detail. For most of these households, the entries simply represented multiple attempts at a transaction. At least once during the month, on February 6, a system problem apparently caused transactions to be rejected for insufficient balance even though the balance was actually adequate. A number of households had several rejections within a period of a few minutes, followed by a successful purchase transaction for the same amount. A recipient rarely had a rejection for insufficient balance on two separate occasions during the month, and no cases had more than two such occasions.

The final non-routine transaction figure presented in Exhibit 4.4 is the conversion of EBT benefits to ATPs. Only 10 of the 3,377 households represented in the exhibit (or 0.3 percent) converted their benefits during February.

In addition to the benefit usage activity presented in the previous two exhibits, a small amount of activity in the Reading EBT system involved households with closed food stamp cases who still had unused benefits in their accounts. The Reading system had 360 such cases in February 1985, equal to 11 percent of the number of cases receiving benefits during the month. These households had unused benefits at the beginning of February totaling $24,251, an average of $67 per case. During the month, these households made 171 purchase transactions totaling $464. Although the data currently available do not allow an estimate of how long a closed case takes to exhaust its remaining benefits, these figures imply that some accounts remain active for several months after benefit issuance stops.

The EBT System Must Provide Balance Information to Recipients

Recipients need to know the amount of unused benefits they have in order to plan purchases. With an ATP system, they can count their unused coupons before shopping. Because an EBT system eliminates coupons, the system must have a way of providing balance information to recipients.

Reading System. The Reading EBT system has two methods to inform recipients. Each EBT purchase receipt has the recipient's remaining balance printed on it, and recipients may call the EBT Center at any time to inquire about their current balance.

According to their responses to a special survey, 87 percent of demonstration recipients relied primarily on their EBT receipts to keep track of their remaining balances. Special wallets to hold the BIC and past receipts are distributed to recipients to reduce their likelihood of misplacing the last receipt.

The remaining balance printed on a recipient's last EBT receipt does not reflect the recipient's current balance if an issuance or a manual transaction has occurred since the last EBT purchase. To obtain a current balance, a recipient calls the EBT Center from any checkout counter BTT (using the attached handset), from a balance-only terminal (located in the 23 largest stores), from the workstation in the welfare office, or from any touch-tone telephone. For calls from touch-tone telephones, recipients use a special telephone number which connects to a Voice Input/Output unit attached to the system's computers. A synthesized voice provides the recipient's current balance. Recipients who call to obtain their current balance indicated that they most commonly call from the store rather than from other telephones.

According to the survey, about 9 percent of the demonstration recipients relied primarily on calls to the EBT Center to keep track of their current balance. This percentage might be higher if more recipients had easy access to touch-tone telephones: only 21 percent of the recipients have touch-tone telephones in their homes. Furthermore, as described in Chapter 3, the Voice Input/Output unit used to respond to phone inquiries malfunctioned at times during the demonstration. If the unit were more reliable, more recipients might rely on this means of obtaining balance information.

The EBT System Must Allow Retention of Unused Benefits

Once food stamp coupons are issued, recipients have no time limit on using them. Unused coupons from one month may be saved and used during subsequent months. In part, this policy reflects the operational difficulties of imposing a time limit on coupon use (e.g., increased printing costs and the administrative costs of maintaining a current inventory of coupons for distribution). The policy also recognizes, however, that issued coupons reflect benefits to which the recipient is entitled. Imposing a time limit on benefit use could, in effect, deny access to authorized benefits.

To match the above policy on retention of unused benefits, an EBT system also must provide for the carry-over of accumulated balances from month to month.

Reading System. A household may use benefits credited to its EBT account at any time during the course of the demonstration. Issuances at the beginning of any month are added to the recipient's current balance, and unused benefits accumulate over time.

The Reading system imposes no time limit on the use of already-issued benefits, even by households that have stopped receiving benefits from the Food Stamp Program. Again, this matches current policy of not imposing a time limit on coupon use. However, this demonstration policy might not be appropriate for an ongoing EBT system. For example, some recipients will die or leave the area without using all of their benefits, and over too long term it would be very costly to carry all of these cases as active accounts.

The only exception to the above policy has been the treatment of benefits issued to recipients who fail to appear for training. Because these recipients do not meet a condition of continuing program eligibility, their cases are closed, and they lose benefits issued to them for the training month.

4.3 REQUIREMENTS RELATED TO RETAILER REDEMPTION OF BENEFITS

The EBT System Must Accumulate EBT Transactions for Retail Outlets

Retailers need to know the total value of food stamp sales at their stores to reconcile their accounts. In addition, accumulated totals must be

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regularly transmitted to the Federal Reserve Bank for redemption and ultimate deposit in the retailer's bank account. Thus, the EBT system must provide a means for accumulating EBT transaction amounts for each retailer.

Reading System. All EBT transactions are logged in a History File at the EBT Center. Each transaction message includes the store's identification number and the purchase (or refund) total. The EBT system appends the date and time of the transmission before logging the transaction.

Each business day, the EBT Center "bundles" all retail transactions. The computer reads through the transaction file and accumulates the net transaction amount for each retailer for the banking day (2:00 PM - 2:00 PM). Transactions occurring on holidays and weekends are included in the next business day's bundle-up. In addition, when system problems have prevented the daily bundle-up, the next day's bundle-up has included transactions from the missed day. From October through February, system problems delayed bundle-up on six occasions.

The bundle-up process totals all transactions for each retailer and writes the following information to tape:

- each retailer's net transaction amount

- each retailer's bank identification number

- each retailer's account identification number at his or her bank

The tape is formatted to specifications of the National Automated Clearing House Association (NACHA). All financial institutions transmitting electronic funds transfers through the Automated Clearing House (ACH) network use this format.

So that retailers can track their EBT sales amounts, each BTT prints all transactions on a journal tape inside the attached printer. In addition, each BTT stores all transactions since BTT sign-on in its internal memory. When the BTT is signed off at the end of the day or the end of the shift, it prints a summary of the day's or shift's transactions. Retailers can use either the sign-off summaries or the printed journal tapes to track total EBT sales.

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To reconcile EBT sales with EBT deposits to bank accounts, retailers need to know total sales by banking day. This reconciliation process has proved troublesome to retailers, as discussed in Section 4.4.

The EBT System Must Initiate Funds Transfers to Retailers' Bank Accounts

An EBT system must allow retailers to redeem the food stamp benefits that they accept in exchange for groceries. This requires that the system transmit purchase information to financial institutions so that retailer accounts are properly credited.

Reading System. As already described, retailer transactions are electronically bundled each business day. EBT Center staff then physically deliver the resulting transaction tape to AB&T's data processing section. AB&T transmits this information to the ACH network the same evening via the Third District Federal Reserve Bank in Philadelphia. On the following morning, the Philadelphia bank distributes credits to retailers' banks, which in turn credit retailers' accounts. AB&T's account with the Philadelphia Federal Reserve Bank is debited by the sum of all retailer credits.

AB&T's account with the Federal Reserve System is credited daily. The morning after each bundle-up, AB&T sends a wire funds request for the sum of all retailer credits through the system to the United States Treasury. The Treasury draws down USDA's letter of credit established for the demonstration, and the Federal Reserve Bank in New York credits AB&T's account. With this procedure completed, AB&T's account with the Federal Reserve System show no net change. The debit charged by the bank in Philadelphia offsets the credit provided by the bank in New York. AB&T charges the Pennsylvania Department of Public Welfare a service fee to cover its expenses for initiating the electronic funds transfer for the EBT system. The service fee is $5.00 per retail account per month plus $5.50 per wire funds request.

AB&T must transmit retailer credits to the ACH network by midnight. At the start of the demonstration, the bank required that all of its customers sending information through the network provide their data by 4:30 PM. In April, AB&T initiated a second, later deadline (8:30 PM) for its largest customers. Because the EBT Center's bundle-up process coincided with peak shopping periods and slowed system processing, AB&T agreed to let the EBT Center use the 8:30 PM deadline. To make it possible for AB&T to process the

bundle-up tape with the later deadline, PRC made a software change to have the tape include the total deposit amount for all retailers.

4.4 REQUIREMENTS RELATED TO RECONCILIATION AND MANAGEMENT

The EBT System Must Provide for Reconciliation of all Transactions

An EBT system transfers funds from one person or institution to another at many points. The system must, therefore, provide a means of reconciling the entire funds distribution process. This requires that each transaction be verified for completeness and accuracy. In addition, the system's financial accounts must be checked frequently to make sure they are in balance.

Reading System. Reconciliation occurs at several different points in the EBT system, as described in detail in Chapter 2. The EBT Center and the state welfare department verify each day's transmission of issued benefits. The EBT Center and AB&T verify each day's transmission of retailer deposit information into the ACH network. The EBT Center checks each recipient and retailer account daily to ensure that the accounts are in balance. FNS, through its Regional Data Center in Minneapolis, compares weekly transmissions of retailer deposits to the drawdown of USDA's letter of credit for the demonstration for the corresponding time period. FNS also compares total issuances for the month (as reported by the state) with total credits to recipients' accounts for the month (as reported by the EBT Center). Finally, retailers reconcile their EBT sales with EBT deposits to their bank accounts.

These reconciliation procedures occasionally discover discrepancies in some funds transfers and accounts. Most discrepancies have occurred because of problems in the reconciliation process itself rather than errors in the distribution of funds. For instance, some of the tapes sent by the EBT Center to Minneapolis were either unreadable or incorrect. Replacement tapes solved the problems. In addition, the software generating the daily system reconciliation reports (used for balancing retailer and recipient accounts) contained errors which have now been corrected.

One example of an actual funds transfer error discovered by the reconciliation process dealt with issuances from the state welfare department. The EBT system's software could not originally process two issuances for the same household on the same day. Such an event occurred early in the demonstration and was identified when the EBT Center verified the day's total issuance. PRC modified the system to handle multiple issuances.

The biggest reconciliation problems have been reported by retailers. Retailers originally expected that they could compare net EBT sales for a particular banking day with EBT deposits credited to their bank accounts the following business day. Several factors make this reconciliation process difficult. The most important is that retailers do not usually track sales on a banking day basis. For instance, if store BTTs do not sign off exactly at 2:00 PM, shift totals printed at signoff will not correspond to banking day totals. In this situation, retailers must check the transaction times printed on the BTTs' journal tapes to determine net sales.

Another problem has been the system's design for handling manual sales. Retailers do not receive credit for manual sales until the EBT Center receives and processes its copy of the manual sales form. Retailers do not know when particular manual sales are credited to their EBT accounts (and then transmitted to AB&T) unless they call the EBT Center for this information.

Finally, although the Federal Reserve sends deposit information to retailers' banks the morning after AB&T transmits this information to the ACH network, some banks apparently do not immediately credit their retailer accounts. This delay compounds the retailers' problems in reconciling one day's sales with subsequent deposits to their accounts.

The EBT System Must Provide an Audit Trail

To support reconciliation activities and the investigation of particular accounts or transactions, an EBT system must provide an audit trail for all transactions.

Reading System. All EBT transactions are recorded on the EBT Center's History File. Each record includes the type of transaction (e.g., issuance, purchase, refund, ATP purchase, or funds transfer to AB&T), the source

and destination of each transaction, and the time and date of each transaction. The History File maintains up to two months of data. Older data are copied to archive files for permanent retention. In response to a request from an authorized agency, the EBT Center can retrieve the transaction records for any retailer or any recipient for any specified time period.

The History File also allows rapid response to questions received from retailers and recipients. Staff at the EBT Center and the BCAO work-station can see by on-line inquiry all transactions for the current month and the previous month. If a retailer calls to ask about total transactions for the day, the operator can query the History File to identify the store's transactions. If a recipient complains that his or her current balance is incorrect, the History File can be used to track all recent issuances and authorized transactions.

The EBT System Must Provide for Regular Management Reports

An EBT system must provide regular reports to allow monitoring of its performance and to supply data for overall Food Stamp Program management.

Reading System. The EBT system generates a large number of reports which measure EBT activities. Several reports document system performance and problem areas. Others provide statistical summaries of the transactions being handled by the system. These latter reports also provide information on transaction activity and current balances for each recipient account.

For monitoring the adequacy of the system's communication network, the system generates hourly reports and daily summaries on the number of calls received by the system's computers. The reports indicate how often (and for how long) the communication network operates at full capacity. To supplement the information provided by these reports, PRC arranged for Bell Telephone to provide reports on the occasions when calls to the EBT Center encounter busy signals.

Separate reports track calls the EBT Center receives from retailers having problems with the system or their EBT equipment. Each report lists the problem being reported and the EBT Center's response to the problem. These reports document the types of problems retailers encounter and the relative frequency of the problems.

At the end of each month, reports summarize EBT system activity. These reports document the number and types of transactions handled by the system. For instance, benefit issuance transactions are reported by type (e.g., regular, prorated, or supplemental), by day of month, and by amount. Recipients' purchase transactions are summarized by day of month, by time of day, and by total amount.

The statistical reports also provide some information on how often recipients have trouble remembering their PINs. Because messages indicating an incorrect PIN come to the EBT Center only after three consecutive incorrect entries, however, the reports do not measure all PIN entry difficulties.

Considerable effort was spent to design management reports that would yield the greatest possible amount of useful information on system activites. Nonetheless, some of the management reports have been difficult to interpret. For instance, tracking account balances and account usage from one month to the next has been difficult because some reports are based on a calendar month and others are based on an "issuance" month. (An issuance month runs from the date of the last month's regular issuance to the date of the current month's regular issuance.) Another example concerns purchase transactions that are rejected because the recipient's account has insufficient funds. Two different situations can generate such a transaction record. A recipient may indeed have insufficient funds to cover an intended purchase, or a clerk may incorrectly enter a very large purchase amount when handling the transaction. These two situations offer very different views of how well recipients and store clerks function in the new system, but they cannot be distinguished in the reports.

Other problems with management reports have concerned the identification of unsuccessful PIN entries and the accuracy of daily system reconciliation reports. Although all unsuccessful PIN entry messages received by the system from store terminals are included in the management reports, the reports cannot distinguish between PIN problems occurring during purchase attempts and those occurring in attempts to obtain balance information. Finally, the software generating the reconciliation reports contained errors which occasionally make the system appear to be out of balance. PRC corrected these software errors.

4.5 GENERAL SYSTEM ISSUES

In addition to the functional requirements discussed in the preceding sections, a number of more general questions must be addressed when preparing for the design and implementation of an EBT system.

To What Degree will the EBT System Eliminate the Use of Food Stamp Coupons?

At its heart any EBT system eliminates food stamp coupons, ATPs, and other intermediate issuance mechanisms. However, specific decisions must be made as to which, if any, recipients will be exempted from the system.

From an administrative point of view, the simplest and most efficient procedure is to include all recipients in the same issuance system. Some concerns may be raised, however, about including certain groups for whom an EBT system might prove too complicated or difficult. Examples that have been mentioned include recipients with limited mental capacity, those who do not speak English, and those living in institutions or confined to home.

Reading System. All food stamp recipients residing within the four central ZIP codes in Reading were transferred to the EBT system. Concerns were raised about how well some groups of recipients would adapt to the new system; these groups received special assistance during initial training. For instance, mentally, emotionally, and physically handicapped recipients were trained in smaller group sessions in January to give them more individualized help with their cards and the EBT equipment. Welfare office staff monitored some of these recipients in January and February to make sure that they were using their EBT benefits.

Spanish-speaking recipients were trained in special Spanish language sessions in January. PRC translated all written training materials into Spanish. When Spanish-speaking recipients call the EBT Center's special number for balance inquiries, they receive information in Spanish. A code on the recipient's account record indicates his or her language preference.

In addition to the above efforts, volunteers from local community agencies received training in the EBT system. Thus, they could provide continuing assistance to any recipients encountering difficulty with the system.

What Geographic Area will be Served by the EBT System?

Choosing a geographic area largely determines the number of food stamp recipients and retail food outlets the EBT system will serve. These numbers, in turn, will affect system design. Both the system's hardware and its overall design configuration must respond to the scale at which it will operate.

It may be necessary to define two geographic areas for an EBT system: the area in which participating households live, and the area in which stores will be equipped to handle EBT transactions. Normal shopping patterns will almost inevitably extend beyond the residential boundaries. To avoid disrupting these shopping patterns, it may be necessary for the area of participating stores to be larger than the area of participating recipients.

In a large EBT system--a statewide system, for example--a smaller proportion of recipients would be affected by this issue. Even with a statewide system, however, many border recipients may cross the state line to shop. An explicit decision must be made about including stores on the other side of the border in the system.

The geographic decisions determine the maximum number of stores that might participate in an EBT system. Not all stores may wish to participate, however. Their decision to participate may depend on agency decisions about where and how the EBT system will work. For instance, the higher the percentage of local food stamp recipients included in the system, the more retailers have to lose by not participating in the system. Retailers' decisions may also be influenced by how much the EBT system intrudes on regular store operations, and by whether or not they have to share in the costs of the EBT equipment.

The EBT system must have a built-in capability to handle more than the original number of participating retailers. New stores may open in the area, and owners of existing stores may change their minds about participating. The system hardware and software must therefore be able to handle more retailers, and procedures must exist for setting up new accounts, equipping additional stores, and training store managers and clerks. Because some stores may close or decide to leave the system, procedures also must exist for closing accounts and removing store equipment.

Reading System. All recipients residing in Reading's four central ZIP codes participate in the demonstration. As discussed in Chapter 2, this area provided a heterogeneous caseload of about 3,870 recipients at the start of the demonstration.

All of the 110 food stamp authorized retailers in the four central ZIP codes had the opportunity to participate in the EBT demonstration. As it became known that demonstration recipients shopped outside the four central ZIP codes, 61 additional stores located within a five-mile radius of central Reading also were given the opportunity to partipate.

About 130 stores (99 within the central four ZIP codes) elected to participate prior to system implementation.[1] In the first four months after system start-up, 20 more stores joined the system. These included stores that had missed the first demonstration enrollment as well as new businesses. The high enrollment resulted, in part, from the probable loss of food stamp sales for non-participating stores and the low direct costs of participating in the demonstration. Since the start of the demonstration, 17 stores which closed or dropped out of the demonstration. Managers of stores that closed indicated that EBT system operations did not affect their decision to close. Those stores dropping out had very few demonstration customers.

How will the EBT System Alter Recipients' Use of their Benefits?

Under some circumstances, an EBT system could adversely affect the level or quality of service provided to food stamp recipients. Three system requirements may help avoid this outcome.

Minimize the Disruption of Recipients' Access to Retail Outlets. This means that stores having a substantial volume of business with participating recipients must be allowed and encouraged to participate in the EBT system.

In turn, this has critical implications for system design. Because retailers are particularly sensitive to checkout productivity (to avoid long lines and possible loss of customers), an EBT system must not disrupt checkout

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[1]Only 110 stores, however, enrolled in time to be equipped at start-up.

procedures. It also must be compatible with retailers' existing procedures for tracking sales and reconciling food stamp redemptions with bank deposits.

Treat Food Stamp Customers Equally to Other Shoppers. Although "food stamp only" lanes are prohibited, excessive delays in processing EBT sales might tempt retailers to require food stamp customers to use specific counters so that their other customers will not be delayed. If the system operates so that EBT transactions are not unduly time consuming, the incentives to restrict participants to selected counters will be minimized.

Allow Recipients to use an EBT System Whenever their Stores are Open for Business. Because some stores are open 24 hours each day, including holidays, the EBT system must be capable of processing purchase transactions on a 24-hour basis as well.

Meeting these three requirements will affect the costs of implementing and operating an EBT system. As more stores join the system, store equipment costs will rise. Furthermore, service calls to outlying stores will be more expensive because travel costs will be greater. Prohibiting "food stamp only" checkout lanes means that more lanes must have EBT equipment. Again, this will increase equipment costs and subsequent costs to service the equipment. Finally, operating costs will be higher when the system has 24-hour coverage.

Reading System. The Reading EBT system strives to meet these three objectives in several ways. Stores outside the central four ZIP codes were invited to participate in the demonstration to minimize the disruption of recipients' established shopping patterns. Within each participating store, all checkout counters have EBT equipment, ensuring equal treatment of food stamp customers. Finally, the system operates 24 hours each day, every day of the year. If the system or EBT equipment malfunctions, the EBT Center authorizes manual sales.

Although the system provides minimal disruption of regular store operations, problems with equipment and processing speed have slowed checkout operations on many occasions (see Chapter 3). Retailers' attitudes about the system and some of their suggestions for system improvement are discussed in Chapter 7.

How Will the EBT System Identify and Address the Needs of Multiple Constituencies?

An EBT system must interact with many people and institutions. These include: retailers; food stamp authorities at the federal, regional, state, and local levels; local financial institutions; the Federal Reserve System; the United States Treasury; participating recipients; and advocacy groups that work to protect recipients' interests. The needs and operating requirements of these different groups must be identified early in the EBT system planning process so that they may be accommodated during system design.

The needs of retailers were discussed earlier. To recapitulate, retailers worry primarily about how an EBT system affects their operating procedures and costs and, ultimately, their profitability. Thus, they will ask how EBT transactions are processed, how the system will change their checkout procedures, how much training will be required, how and when their accounts will receive credits from EBT transactions, and how they can monitor these credits.

An EBT system interfaces with Food Stamp Program operations at many points. State or local authorities transmit food stamp issuance information to the system. They need to reconcile all transfers of funds through the system. They also are likely to have a role in explaining the system to recipients and training recipients in its use. Finally, the agency sponsoring the system needs to monitor its operations to ensure that all functional requirements are being met.

Prior to system design, all these linkages among food stamp operations and authorities must be identified. Procedures for handling each linkage must be developed and agreed upon as the system is designed.

An EBT system provides a new mechanism for transferring recipients' benefits to retailers' bank accounts. This mechanism requires system interaction with several tiers of financial institutions. At the local level, funds are deposited into retailers' commercial bank accounts. These funds must be drawn ultimately from USDA's account at the United States Treasury. Federal Reserve banks act as intermediaries in the transfer of funds from the Treasury to local banks.

Because these funds transfers are new to the Food Stamp Program, procedures must be developed to ensure the appropriate crediting and debiting of all system accounts. EBT system designers must contact representatives from each financial institution interacting with the system to help develop these procedures.

Recipients' needs cover many different areas. For most recipients, using an EBT system will be an unfamiliar experience. To facilitate its use, the system should be relatively simple and "user friendly." Particular recipient groups have special needs that must be identified and accommodated as the system is designed.

Recipient advocacy groups will be very interested in any system which markedly changes the way recipients receive and use food stamp benefits. Their involvement at the beginning of system design can be very valuable. Advocacy groups can help define the special needs and concerns of recipients; they also can provide assistance to recipients once the system is implemented.

Reading System. In soliciting bids for the EBT demonstration, FNS required bidders to obtain commitments from the state food stamp agency and a sample of food retailers and commercial banks in the proposed demonstration area. Thus, the process of identifying and responding to concerns of these various actors began at the bidding stage.

During the design and development phases of the contract, PRC and representatives of the national, regional, state, and local food stamp agencies met regularly. PRC met informally with individual food retailers throughout the process and held two public meetings open to all retailers. PRC also had discussions with the Food Marketing Institute, a national lobbying group representing retailers' interests. Finally, PRC met with representatives of various recipient service and advocacy groups in the Reading area. These groups included the local Area Agency on Aging, Berks County Legal Services, the Berks County Mental Health/Mental Retardation Agency, the Berks County Association for the Blind, the Literacy Council of Reading, several local church groups, and others. Some of the concerns raised at these meetings included the comprehensibility of written materials provided to recipients, procedures for finding out account balances, and the transportation of handicapped recipients to training sessions.

How Will the EBT System Interface with Existing Program Operations?

An EBT system changes procedures for the issuance and redemption of food stamp benefits in a defined geographic area. The system does not replace all Food Stamp Program operations, however. Consequently, it must mesh with other food stamp operations and with all program operations in surrounding areas.

Other food stamp operations within the implementation site include certification, recertification, quality assurance, and overall local and state management functions. The EBT system must leave these other functions unaffected, or means for adapting them must be designed. This requires that the system contractor understand how these functions interact with the issuance and redemption functions. For management functions, the EBT system must provide operations data analogous to those provided by existing issuance and redemption procedures.

The EBT system may have to be phased in unless the number of participating recipients and retailers is small. For instance, to match training requirements with training resources or to load the system in incremental stages, recipients can be trained in groups over a phase-in period. To provide benefits to all recipients during the transaction period, both the coupon and the electronic systems must be operating.

The EBT system design must provide for recipients who leave the implementation site. That is, food stamp benefits must be convertible from electronically maintained benefits to coupons. The sponsoring agency must address the question of when benefits may be converted. The range of options is wide. At one extreme, conversion may be allowed whenever recipients want to shop at a store outside the implementation site; at the other extreme, recipients may convert benefits only when they move (either permanently or temporarily) across system boundaries.

Reading System. The Reading EBT system interfaces with other program operations at a number of points. Although the EBT system does not change the certification function itself, it integrates card issuance and the training of new EBT recipients with the normal certification process. In addition, issuance authorizations from the central state agency take the form of electronic transfers rather than ATP mailings. Procedures for handling lost

and stolen cards, account balance inquiries, and other recipient problems with the system are handled in the local office. Reconciliation reports on benefit issuance and redemption go to state and national agencies. EBT operations had to be tailored to existing systems and procedures at each of these points.

A dual issuance system operated during the Reading phase-in from October through December 1984. Even after that point, the mechanisms for coupon issuance remained, because the Berks County Assistance Office serves both the demonstration area and the remainder of Berks County, where coupons are used. Thus, coupon-related procedures still operate at the BCAO, and banks still function as issuance offices for converting ATPs to coupons.

Stores in the demonstration area continue to accept food stamp coupons, so that recipients living elsewhere can do business with them.

Recipients moving out of the Reading area (either permanently or temporarily) go to the local welfare office to convert their remaining EBT balance to coupons. BCAO policy discourages frequent conversions, however: the recipient's entire balance must be converted, and a recipient may convert benefits only twice during the demonstration period. Thus, demonstration recipients cannot readily obtain coupons for shopping trips outside the demonstration site. In the five-month period extending from October through February, only 110 recipients had their remaining EBT benefits converted to coupons.

Two factors led to this conversion policy. First, too many conversions might impair the usefulness of the demonstration for learning about the operational feasibility of implementing an EBT system. Recipients wishing to avoid the new system, for instance, could constantly convert their monthly benefits to coupons. This would reduce the incidence of EBT transactions at retail outlets as well, giving a skewed perspective of the impacts of an EBT system on retail operations. Second, because each conversion of benefits to coupons requires actions by staff at BCAO and the EBT Center, a high frequency of conversions would increase the costs of administering the demonstration at both locations.

A further issue arose concerning the conversion of EBT benefits to coupons. Although a recipient's remaining EBT balance might not be an even dollar amount, coupons are issued only in even dolla s. Thus, food stamp

authorities had to decide how to handle remaining benefits of less than one dollar. They adopted a policy of rounding benefits up to the nearest dollar before conversion.

What Degree of System Reliability is Required?

If the EBT system is to provide recipients with a level of service equivalent to coupons, it must function reliably. That is, a very high percentage of all attempted food purchases must be accomplished within acceptable time limits through normal procedures. For those transactions that cannot be completed by normal procedures, backup procedures must be available.

Discussions of reliability, particularly reliability of an on-line system, tend to focus on the "up-time" rate of the central computer. Although this is important, it only partially measures how well the system functions. For example, transactions may fail because of problems with a particular store's equipment or because the number of simultaneous transactions exceeds system capacity. Thus, it is important to frame requirements for system reliability with a broader focus than the up-time of a central computer.

Reading System. The Reading design contains two elements intended to ensure system reliability. First, to handle problems with the BTTs in the grocery stores, a team of technicians operating at the EBT Center is available for immediate, in-store assistance. An inventory of spare BTTs and some other components exists at the EBT Center annex so that equipment can be repaired or replaced on the spot. This inventory amounts to approximately ten percent of the equipment in the field.

Second, the design for the central computer system includes two computers operating in tandem. As designed, the primary computer handles all transactions and updates both its own database and the database on the secondary computer. If the primary computer fails, processing immediately transfers to the secondary computer, providing nearly uninterrupted access to the system from store terminals.

If both computers fail (or if a store's only terminal fails), stores may call the EBT Center to receive authorization to process a manual purchase transaction.

As described in Section 3.4, slow processing speeds and occasional system crashes have reduced the reliability of the Reading EBT system. Through the end of February, for instance, the system crashed and was down for five minutes or longer on at least 24 separate occasions. Total downtime during this period (not including planned downtime during off-peak hours for system maintenance) was over 27 hours. Although this downtime represents less than 0.8 percent of total operating time through the first five months of operations, even brief periods of system inaccessibility during peak shopping hours cause aggravating delays at retail checkout counters. In addition, even when the system was operating, numerous slowdowns during this period contributed to delays at checkout counters.

To improve transaction speeds during peak shopping periods, the two computers have been decoupled. This procedure, however, reduces the system's backup capability (in terms of time required to restore the system) if the primary computer fails. Other steps taken to improve service are discussed in Section 3.4.

With respect to the time required to process individual purchase transactions, the system does not generate information that includes time spent verifying the recipient's PIN, entering the purchase amount on the store terminal, waiting for the terminal to dial the EBT Center, and waiting for the receipt to be printed. Direct observations of time spent at checkout counters for individual transactions are being made, however, and the observation results will be presented in a later report.

What Steps can be Taken to Ensure the EBT System's Integrity?

The coupon issuance system faces various forms of fraud and abuse. For instance, Authorization-to-Participate cards and food stamp coupons may be stolen (or falsely reported as stolen). Recipients may sell their coupons instead of redeeming them for authorized food items. Retailers may illegally purchase coupons at less than face value and later redeem them at full value.

An EBT issuance system reduces program vulnerability to these kinds of benefit loss. No paper documents having any redemption value are used in an EBT system. Recipients could, however, sell their benefit card, PIN and Alternate Shopper Card to a third party. Thus, although program vulnerability to such behavior is reduced, it may not be eliminated. An EBT system also may

be vulnerable to other forms of fraud. For example, funds transfer messages transmitted over telephone lines might be electronically intercepted and manipulated to a retailer's or a recipient's advantage. In addition, fraudulent accounts might be established within the system, funded, and accessed through manipulation of the system's software.

Given the potential for benefit loss, the design of an EBT system needs to incorporate procedures for ensuring the integrity of all funds transfers and all EBT accounts.

Reading System. The Reading EBT system has five points of external interface: issuance transmissions from the state welfare department to the EBT Center; transmissions from the Berks County Assistance Office to the EBT Center for card encoding and other account maintenance functions; purchase and other transmissions from store BTTs to the EBT Center; balance inquiries to the EBT Center from telephones; and transmission of retailer deposits from the EBT Center to AB&T.

The EBT system design incorporates procedures at each of the above interfaces to protect the integrity of the system. Some of these procedures are described below; others have been discussed in earlier portions of the report.

The state welfare department has the capacity to encrypt supplemental issuance data before transmitting it to the EBT Center. The encryption hinders any attempt to intercept and modify the transmission before the EBT Center receives it. For regular monthly issuances, the state uses an established courier service to hand carry the issuance tape to the EBT Center.

All transmissions from the BCAO workstation to the EBT Center are encrypted. To provide further security, staff operating the workstation need to enter their identification code and a password before initiating a transmission. Each person's code indicates which EBT functions (e.g., card encoding, balance inquiry, updating record information) that person is authorized to perform. Any irregular transmissions can be traced to the staff member initiating the transmission.

Transmissions from store BTTs to the EBT Center are protected with a special code. This code (called the Transaction Account Code, or TAC) is described in Chapter 2. If a transmission is intercepted and modified, or if

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telephone line problems degrade the transmission in any way, the transmitted code will not match the code computed by the system, and the system will reject the transmission.

Recipients must enter their card number and PIN on a touch-tone telephone when calling the EBT Center for balance information. This prevents disclosure of recipients' account balances to unauthorized persons.

Transmission of retailer deposits to AB&T occurs via hand delivery of a computer tape. AB&T edits and returns the tape with a listing of retailer accounts that have been credited. The EBT Center uses the listing to verify the accuracy of the transmission.

In addition to these procedures, the reconciliation procedures described in Chapter 2 identify instances in which funds transfers are either incorrect or credited to inappropriate accounts. To protect the system from tampering by operations personnel, all EBT Center staff are covered by a company fidelity bond. Access to the EBT Center is limited to authorized personnel.

4.6 REQUIREMENTS FOR SYSTEM DESIGN REVIEW

In addition to establishing the functional and special requirements for system design, food stamp authorities need procedures for reviewing the design before authorizing its development and implementation.

Review Objectives

The design review has several objectives. First, the review should determine whether the system design meets all the functional and special requirements that were initially established. Second, if performance standards have been established for the system, the review should evaluate whether or not the system, as designed, is likely to meet the standards. Third, the review should study the procedures for integrating the EBT system with other program operations to ensure that the system will properly interface with other program functions. Fourth, the review should check that all interfaces between the system and other institutions have been identified and appropriately integrated into the overall design.

System Documentation

To support this review activity, the system contractor must fully document the EBT system design. The documentation should include a complete description of how the system will operate, including the responsibilities of system staff, Food Stamp Program personnel, retailers, recipients, and personnel at financial institutions.

In conjunction with the description of how the system will operate, the documentation should list all required equipment and its operating parameters, market availability, and past reliability performance. If the design requires that equipment be used in a novel application or configuration, this should be noted and its applicability to the EBT system and expected reliability discussed. To aid in evaluating the system's likely performance capabilities, the contractor should note any limitations imposed by the proposed equipment.

The contractor should include a discussion of the system's expected performance capabilities. Any assumptions used to estimate performance capabilities should be thoroughly documented so that their reasonableness can be evaluated during the review.

If implementation of the designed EBT system will require any changes in state operating regulations or Food Stamp Program regulations, these changes should be noted in the documentation.

Finally, either the proposed system design or the market cost of required equipment may have changed since the original contract. The documentation should therefore include the anticipated costs of implementing and operating the proposed system.

Review Procedures

To accomplish its objectives, the design review needs to include representatives from all agencies or institutions that will be affected by the system. These representatives need to review the written documentation and provide comments on any problems they foresee with the planned system. In particular, each reviewer needs to determine whether the responsibilities placed by the system on his or her agency or institution can be met. Any

omissions in the planned interface with the agency or institution should be noted.

Given the complexity of EFT technologies, food stamp authorities may need help from outside experts when reviewing an EBT system design. Outside assistance may be especially necessary when reviewing the proposed system's performance capabilities. Any experts brought in for assistance should be familiar with the particular hardware configuration proposed for the system.

Ample time should be allowed for the design review. The documentation will be extensive and complex. Many different people will need to review the documentation, and their comments must be assembled and evaluated. In addition, the review may well raise issues that must be resolved before accepting the system design. Although the contractor may be able to address some issues quickly, others may require considerable time. This is particularly true if the contractor needs to meet with other agencies or institutions, or to change the system's design.

Finally, the sponsoring agency should recognize that design changes will almost inevitably be needed during the subsequent development of the system. External conditions may change, or the development process may reveal design issues not recognized by the design review. When the basic design is updated or revised, procedures should be in place to inform all affected parties and to obtain comments on the proposed changes. Any changes approved by the sponsoring agency should be documented and included in the basic design plan.

Review of the Reading System Design

The design for the Reading EBT system was reviewed at the Critical Design Review, held in October 1983. PRC provided a Detailed System Design document to all parties included in the review. These parties included representatives from FNS, USDA's Office of the Inspector General, the regional state and local food stamp agencies, and AB&T. Preliminary drafts of users' manuals, an acceptance test plan, and an implementation plan were available for review in addition to the design document.

Because the system design changed so many issuance and redemption functions in the Food Stamp Program, waivers had to be obtained for many program regulations. In general, these waivers replaced regulations covering issuance and redemption procedures with the procedures planned for the EBT system. Before granting the waivers under its general waiver authority for demonstration projects, FNS had to publish a General Notice (and, later, an Amended General Notice) in the Federal Register detailing the procedures for the Reading demonstration.

The Reading EBT demonstration needed no waivers to Pennsylvania state regulations.

The Critical Design Review raised a number of significant design issues, as noted in Chapter 3. These issues included the final determination of the scope of PRC's responsibilities in operating the EBT Center, recognition that discussions were needed with representatives of the Federal Reserve System to establish electronic funds transfer procedures, and recognition that a special waiver was required to authorize the use of PL/1 as the system's programming language. Resolution of these and other issues required three months and delayed FNS in authorizing system development. To avoid excessive schedule delays, FNS authorized some development activities earlier. These included preliminary software development and ordering the system's primary computer.

CHAPTER 5

REQUIREMENTS FOR SYSTEM DEVELOPMENT

Chapter Five

REQUIREMENTS FOR SYSTEM DEVELOPMENT

Once an EBT system has been designed to meet the functional requirements and general issues discussed in Chapter 4, the next step is to develop the system. This includes all activities needed to build and test a working prototype of an EBT system and to prepare for the ultimate use of the system:

- acquiring and installing system hardware

- writing and debugging all system software

- testing and correcting the prototype

- preparing operating manuals, training materials, and training plans for all persons who will operate and use the system

This chapter discusses each of the above development tasks. Because hardware and software needs vary greatly according to the system design, the chapter does not describe hardware and software development activities in detail. Instead, it reviews the kinds of equipment that were obtained and the major software modules that were developed for the Reading EBT system. Procedures for the remaining two tasks (i.e., testing and evaluating the prototype and developing operating manuals and training materials) depend less on the type of system developed and are described in more detail.

5.1 HARDWARE ACQUISITION AND INSTALLATION

Hardware Development Activities

The most problematic aspect of this task is the scheduling. Equipment choices are not made until the end of the design phase, and orders cannot be placed until those decisions are final. Nevertheless, some items, particularly major computer components, require several months between order and delivery. The scheduling of the development phase must anticipate these delays; if it does not, hardware acquisition can become a bottleneck for the whole development process.

Much of the hardware needed for an EBT system can be purchased in a form that needs little or no modification. As point-of-sale systems become more common, the increased variety of available equipment may make alterations totally unnecessary. In the meantime, however, the system developer must plan for any equipment modifications needed for a particular EBT application.

Once the required hardware is obtained and modified as needed, the components need to be tested to ensure they operate correctly. The individual components then need to be assembled into the system prototype. At this point, the configuration of the hardware should duplicate the system's planned implementation configuration. The only major exception is that the prototype typically need not contain more than a few benefit terminals in order to develop and test system software and operating procedures.

Reading Demonstration. IBM required about 60 days to deliver each of the Series/1 computers used in the Reading EBT system. To avoid schedule delays, FNS authorized PRC to order the first computer prior to its authorization to begin most system development activities. The second computer was ordered several months later.

Because the Benefit Transaction Terminals (BTTs) had delivery schedules of from 90 to 120 days, PRC ordered the terminals well in advance of their scheduled installation dates.

In addition, PRC needed to modify the BTTs for the Reading system. For example, the built-in programming of the terminals had to be modified to perform the internal PIN verification check. Another modification made the BTT compute a security code (the Transaction Account Code) before transmitting messages to the system's computers. Finally, PRC had to fabricate the cables connecting the miniprinters to the BTTs.

Major Hardware Elements in the Reading System

The hardware elements used in the Reading EBT system are described below in terms of the major authorization, issuance, and redemption functions performed by the system. (See Section 2.3 for system operations related to each function.)

<u>Benefit Authorization Equipment</u>. The state welfare department's data processing center in Harrisburg issues benefits for demonstration recipients. The State's Sperry Univac 1100 computer is used, without hardware modification, to maintain information on demonstration households and to generate issuance files. The state transmits these files to the EBT Center either by the physical delivery of an issuance tape or by electronic transmission over a commercial telephone line. The only hardware addition for this function is:

- a Racol-Milgo data encryptor

The encryptor provides secure transmission of issuance data over commercial telephone lines.

In a large EBT system covering an extensive geographic area, card issuance and encoding might occur at a number of locations. In the Reading demonstration, these functions take place at a single location, the EBT workstation at the Berks County Assistance Office. Encoding of recipients' benefit cards requires the following hardware:

- an IBM/PC microcomputer with video monitor

- a Bell 212A compatible modem

- a Racol-Milgo data encryptor

- a Magtek card reader

- an OMRON CAT-100 terminal and PIN-pad

The microcomputer communicates with the system's computers at the EBT Center, using the modem. Once the communications link is established, the monitor displays a menu of functions. The BCAO employee selects the "PIN assignment" function, places the recipient's card in the encoder, and enters the recipient's PIN on the PIN-pad. The card's magnetic stripe is then encoded with a system-generated card number, a PIN offset (a special code based on the card number and the PIN), and a check-sum digit (a code based on the card number and the PIN offset). The operator then passes the card through the card reader, and the system verifies that the correct number has been encoded on the card. The PIN offset is sent to the EBT system and placed in the household's account record. Transmissions from the workstation to the EBT Center are encrypted.

Recipients are trained to use the system when their cards are encoded. Part of this training includes the use of:

- an OMRON CAT-100 Benefit Transaction Terminal (BTT)

- an OMRON PIN-pad

- an NCR miniprinter

The BTT includes a keyboard and video display, a telephone handset, and an internal modem. The PIN-pad and miniprinter are attached to the BTT, as previously shown in Chapter 2 (Exhibit 2.1).

The Reading welfare office uses eight sets of BTTs, PIN-pads, and miniprinters for training. Each set is configured to simulate the equipment at checkout counters in retail stores. The sets are linked to the EBT Center's computers. Recipients practice using their PINs and cards to obtain account balances.

Benefit Delivery Equipment. Nearly all checkout counters in the approximately 145 retail food outlets participating in the demonstration can process EBT transactions. Each has:

- an OMRON CAT-100 Benefit Transaction Terminal (BTT)

- an OMRON PIN-pad

- an NCR miniprinter

PRC selected the OMRON terminal over other commercially available terminals for three major reasons. First, the OMRON CAT-100 terminal had a record of high reliability. Second, the manufacturer provided PRC with the code controlling all terminal functions. This enabled PRC to make the previously mentioned modifications necessary to meet design objectives. (Other manufacturers wanted PRC to give them terminal specifications, which they would then implement.) Finally, the manufacturer agreed to supply technical assistance to PRC in implementing the required changes to the terminals.

The BTTs are located within reach of store clerks, who enter purchase or refund amounts and select the function keys on the keyboard controlling each transaction. The PIN-pads are located within reach of recipients, who must enter their correct four-digit PINs for each transaction. Printers are often located under the checkout counter. The clerk tears off

the printed receipt after each transaction and hands the receipt to the recipient.

For households leaving the demonstration area, one further piece of equipment is needed. In the Reading demonstration, recipients must go to the Berks County Assistance Office to have their remaining EBT benefits converted to an Authorization-to-Participate (ATP) card. A clerk uses the IBM/PC micro-computer at the BCAO workstation to connect to the EBT system's database. Using a special "purchase ATP" function listed on the menu, the clerk sets the recipient's remaining EBT balance to zero. The recipient gets an ATP for the value of the balance, rounded up to the nearest whole dollar amount.

Verification of Identity Equipment. The primary means of verifying a recipient's identity is the system's check of the entered PIN. This verification is performed at the checkout counter using the following equipment:

- an OMRON CAR-100 Benefit Transaction Terminal (BTT)

- an OMRON PIN-pad

After the recipient's card is passed through the terminal's card reader, the recipient enters his or her PIN on the PIN-pad. The BTT internally calculates a PIN offset based on the entered PIN and the card number encoded on the recipient's card. It then compares this computed offset with the offset encoded on the recipient's card. If the two offsets match, verification is complete.

Recipient Redemption Equipment. In an EBT system, benefits are simultaneously delivered and redeemed when the recipient buys groceries. Thus, the hardware necessary to perform this function in Reading is the store BTTs, PIN-pads, and miniprinters described above under the benefit delivery function.

Recipients can check their remaining balance by calling the EBT Center. These calls may be placed from:

- any telephone having touch-tone service

- the handset connected to any store BTT

- the BCAO workstation

- any balance-only BTT (located in the 23 largest stores in the demonstration)

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The balance-only terminals do not have a handset or an attached PIN-pad. The recipient enters his or her PIN on the BTT's keyboard, and the account balance appears on the BTT's video display.

Retailer Redemption Equipment. Retailers' bank accounts are credited with EBT sales after the EBT Center transmits their deposit information to a processing bank (AB&T in the Reading project). The bank enters this information into the Automated Clearing House (ACH) network operated by the Federal Reserve System. No additional hardware is required at this bank or at retailers' banks for this function.

Bank Redemption Equipment. For bank redemption in the EBT system, the processing bank initiates a wire funds request through the Federal Reserve System to the United States Treasury. No additional hardware is required for this function.

EBT Center Equipment. Major functions performed at the EBT Center include account maintenance, transaction processing, transmission of retailer deposit information to the processing bank, reconciliation, and regular system maintenance. In larger EBT systems, these function might be performed at multiple locations in a distributed processing network rather than at a central site.

The main hardware elements at the Reading EBT Center are:

- an IBM/PC-XT microcomputer with:
  a video display
  an Epson FX-80 printer

- an IBM Series/1 4956-C computer with:
  an IBM 4963 disk unit with 64 megabyte capacity
  an IBM diskette reader
  an IBM 4968 tape unit
  an IBM 3101 display terminal
  an IBM PL/1 compiler

- an IBM Series/1 4954 computer with:
  an integrated 30 megabyte disk
  an IBM diskette reader
  an IBM 4968 tape unit
  an IBM 3101 display terminal
  an IBM PL/1 compiler

- an IBM 4959 input/output expansion unit with:
    an IBM Two Channel Switch
    an IBM 4987 programmable communication subsystem
    an IBM 4967 cache disk with 200 megabyte capacity
    a Centronix 6085 printer

- a Dacon Call Sequencer with:
    seven Hayes Smart Modems (300 BAUD)
    an Okidata printer

- two Hayes Smart Modems (1200 BAUD)

The IBM/PC-XT microcomputer serves as the EBT Center's EBT worksta-
tion. All functions performed at the BCAO workstation also can be performed
at the EBT Center. (These functions are described in Section 5.2.) In addi-
tion, EBT Center operators use the workstation to place temporary debits
against recipients' accounts when authorizing manual sales. Reconciliation of
temporary debits (when the EBT Center's copy of the manual sales slip is
received) also is performed at the workstation.

The IBM Series/1 4956-C is the system's primary computer. The 4954
serves as the backup computer. The primary computer has more local memory and
faster processing speeds than the backup computer. In addition, it is
equipped with a larger disk than the backup computer. The extra disk space is
used to hold software programs needed to run batch jobs like retailer bundle-
up, system reconciliation, and management reports.

The two computers are linked with an IBM input/output expansion
unit. Attached to this unit is a Two Channel Switch, which switches proces-
sing from the primary computer to the backup computer when the primary unit is
down. The IBM 4987 programmable communication subsystem contains the Voice
Input/Output unit which responds to telephone inquiries for account bal-
ances. In March 1985, PRC added a cache disk with 200 megabyte capacity to
the expansion unit to improve system access to disk space. The cache disk
holds the system's Master File and History File. Before March, these two
files were stored on the 64 megabyte disk attached to the primary computer.

A Dacon Call Sequencer usually routes calls coming into a computer
system to different processors or workstations. The EBT Center, however, uses
the sequencer only to monitor the number and duration of calls coming from
store terminals to the Center through six incoming telephone lines. (Calls

entering on a seventh line, added in March, are not monitored.) Line usage reports are printed on the Okidata printer.

The two 1200 BAUD Hayes modems receive data transmissions from the state welfare department and the BCAO workstation.

In addition to the EBT Center in Reading, PRC maintains a second office in Reading to provide work space for its field technicians. No major hardware is maintained at this office. It only stores system supplies and spare equipment.

5.2 SOFTWARE DEVELOPMENT

Software Development Activities

The amount of software development needed for a particular EBT system depends on how closely the planned system mirrors previously developed point-of-sale systems. For example, all software developed for the Reading EBT system will be available to food stamp authorities if they wish to implement EBT systems similar to the Reading system. In addition, extensive commercial development and testing of other POS systems is now taking place. As a result, "packaged" systems may soon be available from commercial vendors. Any commercially developed packages, however, are likely to be geared toward the needs of the banking industry, and these packages--when they become available--may need substantial modification to fit the needs of a food stamp EBT system. Thus, the sponsoring agency (or its contractor) will need to determine the cost-effectiveness of modifying an existing package versus developing an entirely new system.

Two major objectives guide software development for an EBT system. First, software must support the system's accurate processing of all required functions. For instance, the system must debit the appropriate recipient's account and credit the appropriate retailer's account by the correct amount whenever a purchase is made. Second, system software must make processing efficient. Efficient processing is particularly important to keep transaction times in stores short enough for the retail community to accept them.

Software development typically involves five steps: general design, detailed design, writing code (the system's operating instructions), testing and debugging individual pieces of code (software modules), and testing and

debugging the integrated system. The general design step will normally be part of the design phase of the overall project. The remaining steps occur in the development phase.

Finally, the software development process may raise design issues overlooked during the design phase. These issues are likely to be identified when the system developer writes code for the system software. Because this code must detail exactly what the system must do to meet each functional requirement, inconsistencies or omissions in the system design may be discovered at this time.

Reading Demonstration. No suitable software package for a food stamp EBT system was available for the Reading demonstration, and PRC developed the following software modules for the Reading system:

- Database application--Creates and updates records in the History File (which records all transactions) and the Master File (which maintains account balances).

- Transaction processor--Copies onto the secondary computer transactions that occur on the primary computer and stores transactions externally for recovery in case of a system crash.

- PDPW interface--Receives issuance transmissions from the Pennsylvania Department of Public Welfare, translates them into messages to the database application module, and creates the acknowledgement information transmitted back to the PDPW.

- BTT interface--Receives purchase, refund, and balance inquiry transmissions from grocery stores, sends appropriate requests to the database application module, and sends results back to the BTT.

- BCAO interface--Receives and responds to transmissions from the Berks County Assistance Office workstation concerning the assignment of card and PIN numbers, changes in account status, and account inquiries.

- Voice input/output interface--Receives and responds to recipients' telephone requests for balance information.

- Processing bank interface--Calculates the credits due each retailer in the daily funds transfer process, creates the tape in the appropriate format for delivery to the processing bank, and reconciles the bank's acknowledgement tape when it is received.

- **Report writer**--Compiles information from the History and **Master files** and produces management reports, audit trail reports, and reconciliation reports.

- **History and archive**--Purges the History File of transaction records each month and stores them in an external **Archive File.**

In addition to these EBT Center software modules, software had to be developed for the EBT workstation at the Berks County Assistance Office to support the following functions:

- **Data entry**--Creates employee user profile records that control which functions can be accessed by individual employees.

- **History function**--Displays the current and previous month's history of purchases and other transactions for recipient or retailer accounts.

- **PIN assignment** function--Encodes benefit cards with the recipient's PIN.

- **Query function**--Displays the information contained in recipient or retailer records.

- **Reissue BIC** function--Reissues a benefit card for an already existing account.

- **Update** function--Updates or changes non-monetary information contained in recipient or retailer accounts, and places a "hold" on an account when a card is reported lost or stolen.

The state welfare department also had to change some existing software for the Reading demonstration. Department personnel modified software controlling the state's Food Stamp Master File to allow demonstration recipients' records to be identified and a separate file of these records to be extracted for EBT issuances.

Finally, American Bank and Trust rewrote some of its software to allow later processing of their larger commercial accounts. Beginning in April 1985, the bank offered this later processing deadline (8:30 PM) to the Reading EBT system, and PRC changed the software in the processing bank interface module to meet AB&T's new requirements for the format of the

retailer bundle-up tape. The new format required that the total transaction amount as well as individual retailer transaction amounts be listed on the tape.

Programming Language Considerations

Prior to actual software development, the programming language for the system must be selected. At least four factors will affect this selection:

- Operating systems for particular computer hardware will support only specified languages. Selecting the hardware for the system will limit the range of potential programming languages.

- Because different languages have been developed for different applications, some of the potential languages may not be suitable for a particular EBT application.

- Given a particular application, some languages may be more efficient than others. That is, the computer system requires less time to "read" the instructions and act upon them.

- The developer may have greater familiarity with certain languages.

Reading Demonstration. The operating system for the IBM Series/1 computers supports four different programming languages: FORTRAN, PL/1, COBOL, and EDL. Of the four languages, EDL (for Event Driven Language) is the most efficient because it most closely approximates actual machine code. (Any programming language must be translated into machine-readable code by a compiler before the computer can act upon programmed instructions.) PRC system designers rejected the use of EDL for the Reading system, however, because they realized that EDL is not an approved language for federally funded computer applications, and they doubted that a waiver to use EDL could be obtained. Of the three remaining available languages, PRC selected PL/1 as the system's programming language. This choice was based, in part, on the recommendation of an IBM system engineer.

After specifying the Reading system's general software design, PRC discovered during the Critical Design Review that PL/1 also is not an approved language for federal application. Thus, before actual software development could begin, PRC had to seek and obtain a federal waiver to use PL/1.

In retrospect, it appears that EDL may have been a more suitable programming language than PL/1 for the Reading EBT system. Some of the system's problems with slow processing speeds stem from the use of PL/1. If EDL had been selected, however, PRC might have needed more time to develop the software for the EBT system. That is, although EDL is a more efficient programming language than PL/1, more time and effort is normally required to write and test EDL code than PL/1 code.

Monitoring Software Development

Software development consumes the largest single block of effort in the overall process of establishing an EBT system. This effort may be difficult to monitor if the sponsoring agency uses an outside contractor to develop and implement the EBT system. Not only does software development require much time to complete (e.g., six months elapsed between PRC's authorization to begin system development and the Functional Demonstration Test), there are few intermediate milestones by which progress can be measured.

To enhance its monitoring capability, the agency may wish to hire a consultant to review the contractor's software development activities. This consultant should be familiar with the hardware and software specified in the system design. Hiring a consultant, however, has a disadvantage: the contractor will have to spend some time and money to prepare intermediate material for external review. There also may be disagreements between the contractor and the consultant which the agency will have to resolve. The advantage of hiring a consultant is that the external review may lead to a more efficient and better performing final system. Factors to be considered in deciding about external review are the contractor's previous experience and track record in developing electronic funds transfer and point-of-sale systems and the uniqueness of the planned design.

Reading Demonstration. During PRC's actual development of software for the Reading system, no formal monitoring of software development activities was performed. FNS and PRC held regular weekly management meetings during this period, however, at which time PRC updated FNS with its progress in writing and testing software.

5.3 SYSTEM TEST AND EVALUATION

Once the hardware is integrated and software written, the prototype must be tested. The purpose of the test is to ensure that the prototype can handle all system functions properly. When the prototype works correctly, the system can be installed on-site. At that time, a second test should be performed to demonstrate the system's readiness for EBT operations.

Test Procedures and Evaluation

Because system functions involve both system processing and interactions with other agencies or organizations, these other parties need to be included in the test. Thus, food stamp staff act both as observers and as participants during the test. As participants, they transmit and reconcile issuance data, train recipients to use the system, issue benefit access cards, update information in recipients' file records, and verify that retailer deposit data and debits against USDA's food stamp account are in balance. The food stamp staff will probably perform these functions during the actual operations of an EBT system.

In addition to food stamp staff, the test should involve at least one retailer. This is to allow testing of the prototype's processing of sales transactions. Financial institutions also are involved in order to test the electronic funds transfer of retailers' deposits. Because EFT networks usually will not process dummy deposit transactions, at least one retailer should have an actual EBT sale during the test. This sale can then be transferred and tracked through the EFT network to the retailer's bank.

To complete an actual sale, at least one food stamp recipient should be given EBT benefits for the test. The recipient then must use these benefits at the store participating in the test.

Insofar as possible, the test should include an evaluation of the prototype's capacity and performance capabilities. Because the prototype need not process a large number of transactions to determine its ability to handle all required system functions, this evaluation may be difficult. Nevertheless, a careful evaluation of the time the prototype requires to process even a few transactions should indicate whether the contractor's original expectations about processing speeds are being met.

To ensure a complete evaluation of the prototype's operations, a test plan should be formulated and followed during the test. The plan should detail exactly which procedures to test at each step of the EBT issuance and redemption process. Because some test events may occur rapidly, the plan should include a guide for observers. The guide explains what each observer is responsible for evaluating, and has checklists for observers to mark as events occur. These checklists can serve as the basis for summarizing the evaluation of the prototype.

After the test, all observers and the system contractor need to meet and evaluate the results of the test. Any problems or omissions noted by the observers must be resolved. Some retesting of system functions may be necessary before the sponsoring agency approves the system for implementation; the schedule for developing the system should anticipate this need.

Reading Demonstration. The Reading EBT prototype was tested during the Functional Demonstration Test in July 1984. The test included participants and observers from PRC, AB&T, one retailer in Reading, and food stamp staff from the national, regional, state and local offices. One food stamp recipient was issued EBT benefits and an EBT card for the test. After completing a purchase transaction at the participating retail outlet, the retailer's deposit amount was transmitted through the Automated Clearing House network to the retailer's bank account.

The test ran for four days. On the first day, staff created an issuance file and transmitted the file via computer tape to the contractor's headquarters in McLean, Virginia. The file included benefits for the one food stamp recipient participating in the test. Several other dummy records were included for later testing of system functions.

The issuance file was loaded onto the prototype's database on the morning of the second day. Later that morning, all local welfare office functions interacting with the EBT system were tested. These included encoding the recipient's card, updating the database, converting EBT benefits to coupons, and querying the system for account information. Functions involving the retailer's BTT also were tested, including (dummy) purchases and refunds, balance inquiries, PIN verifications, and a manual sale.

In the afternoon of the second day, internal system functions were tested. These included retailer bundle-up (still using information on dummy accounts) and system reconciliation. Procedures for transmitting deposit information to AB&T also were tested.

The third day started with training the recipient selected for the test. During training, the recipient was given the benefit card encoded the previous day. Later that morning, she made an EBT purchase at the participating retail store. The afternoon was again spent with bundle-up and system reconciliation. After bundle-up, the retailer's EBT credit was transmitted to AB&T via tape, and AB&T entered the deposit information into the Automated Clearing House network. That evening, the network transferred funds from AB&T's account to the retailer's bank.

On the fourth day of the test, AB&T sent a wire funds request to the United States Treasury, which debited USDA's letter of credit established for the test by the amount of the purchase made the previous day. Observers verified that the purchase amount had been deposited in the retailer's bank account.

For each step of the test, participants followed a script prepared by PRC. In some respects the script was quite detailed. For example, to ensure the proper testing of the system's ability to verify a recipient's PIN, several non-valid PINs listed in the script were entered at the retailer's BTT. Some parts of the script were not so detailed. For instance, the recipient selected for the test was simply told to make a purchase at the participating store.

As discussed in Chapter 3, the Functional Demonstration Test identified several problems with the EBT prototype. For instance, the store BTT's internal PIN verification procedure incorrectly accepted several invalid PINs. Test observers also noted some functions not tested, e.g., the electronic transmission of issuance data from the state welfare department. To complete the test, PRC fixed the PIN verification problem and retested this function about two weeks after the Functional Demonstration Test. PRC and the state also tested the electronic transmission of issuance data at about this time. In addition, PRC addressed several other issues raised during the test (and described in Chapter 3) during this period.

5.4 DEVELOPMENT OF TRAINING MATERIALS AND TRAINING LOGISTICS

Training Materials

Everyone who will operate, communicate with, or use an EBT system needs to be trained. The trainers and any other people providing assistance to system users also will need training. Toward this end, training materials need to be developed and reviewed.

Groups who will have different kinds of interactions with an EBT system must have training materials tailored to their needs. These groups include:

- operations and support staff at the system's computer center

- data processing staff at the state welfare department and at financial institutions

- income maintenance workers, issuance clerks and supervisors at the welfare office

- retail clerks and store managers

- recipients

- trainers and any other groups providing assistance to system users

Reading Demonstration. As described below, PRC developed training materials for the above groups. The last group (trainers and those providing assistance) included:

- state welfare department staff who trained recipients

- community agency staff who served as information resources to recipients

- a special group of facilitators from the FNS regional office and its field office in Philadelphia who provided assistance to retailers and recipients during the first week of operations

Operations Staff. PRC installed the system and had it ready for operations before operations and support staff were trained. This allowed training to include a "walk-through" of all system functions.

PRC developed and used an "EBT Center Operations Manual" to document all system operating procedures. This manual, which was used as the guide for training, provides detailed instructions on the procedures for:

- startup and shutdown of the EBT system

- system backup

- system recovery

- tape management

- disk management

- equipment maintenance

- daily operations

Daily operations requiring operator intervention include:

- receipt of transmission of recipients' benefits

- update of database with recipients' benefits

- transmission of benefit acknowledgement

- bundle-up

- system reconciliation

- report generation

- other reconciliation procedures

The operations manual also includes a section covering the procedures for performing all workstation functions. (Described in Section 5.2 above).

Data Processing Staff at the State and AB&T. Data processing staff at the state welfare department and at AB&T needed no formal training. During system design and development, the responsibilities of staff at each location were established and reviewed. These staff also participated in the Functional Demonstration Test and the System Acceptance Test, which provided opportunities to ensure that they understood and correctly performed EBT procedures.

Welfare Office Staff. Prior to training staff of the Berks County Assistance Office (BCAO), PRC established the EBT Center and installed the EBT workstation at the office.

Training included an overview of how the EBT system works and a walk-through of all workstation functions. This training used a "BCAO User Manual" developed by PRC and used as a guide for training. This manual includes:

- a system overview

- a section for income maintenance workers covering:
  system operations and functions
  problem situations (e.g., lost cards, forgotten PINs)
  and corrective actions

- a description of system account files

- operating instructions for the workstation

- a description of workstation functions

- a description of EBT system reports

- a supervisor's supplement

In addition to this training, BCAO staff participated in the Functional Demonstration Test and the System Acceptance Test, gaining further review of their responsibilities.

Retail Clerks and Managers. Training of the retail managers and clerks was done on store BTTs, PIN-pads, and printers. Although this equipment was not connected to the system, the BTTs were set in a special "training mode" so that all BTT functions could be demonstrated. These functions included sign-on, sign-off (with receipt), balance query, purchase and refund (with receipt), and PIN verification. During training sessions, special benefit cards activated the equipment.

PRC developed a "Retailer User Manual" for the demonstration. This manual was used during training. It includes sections on:

- an overview of the system

- an introduction to operating the BTT

- operating instructions for all BTT functions

- corrective actions when errors occur

- how to perform a manual sale

- checking out the cash drawer

- guidelines for assisting recipients

- a special section for managers on reconciliation procedures and transactions requiring manager authorization (e.g. refunds).

In addition to the "Retailer User Manual," PRC prepared a small BTT user guide which details BTT operations. During equipment installation, stores were given one guide for each BTT in their store. Clerks can check these guides during system operations to refresh their memories about proper operating procedures for the EBT system.

Demonstration Recipients. All recipients were trained at the BCAO after system start-up. As discussed in Chapter 3, training included the presentation of a videotape showing recipients how to use the system. Eight sets of BTTs, PIN-pads, and miniprinters simulated checkout counters in the two training rooms. Recipients practiced using this equipment for balance inquiries and PIN entry. The terminals were hooked up to the EBT Center's computers to enable access to account information.

Because recipients received encoded benefit cards during training, the entire BCAO workstation functioned during these sessions. Recipients, however, did not have access to the workstation; BCAO employees carried recipients' BICs to the workstation for encoding.

During training, recipients received an eight-page booklet (in English or Spanish) describing how to use the system for food purchases. In addition, they received an Alternate Shopper card, a plastic wallet to hold their benefit card and EBT receipts, and a flyer (printed in English and Spanish) telling children how to use their parent's card, PIN, and the Alternate Shopper Card for shopping.

State Welfare Department Trainers. During system start-up, state employees trained demonstration recipients in how to use the system. Prior to start-up, PRC instructed these trainers on how to conduct the training sessions for recipients.

PRC developed a lesson plan for trainers to use during each session. The plan covered all material to be presented, as well as a recommended script to follow. The lesson plan contained the following activities:

- explain reason for session

- show first part of videotape

- have recipients choose their PIN

- collect envelopes (with PINs inside) and explain encoding

- show second part of videotape

- hand out the following recipient materials
    handbook
    list of participating retailers
    encoded benefit card and wallet

- explain Alternate Shopper Card

- explain manual sales

- practice with equipment

- explain how to check balances

- explain what to do if card is lost, stolen or damaged

- review major points of training

Major points stressed at the end of each session were:

- keep PIN a secret

- need to know balance before shopping

- no change provided by system

- manual sales possible if system does not work

- what to do if balance is insufficient

Community Agency Volunteers. PRC trained volunteers from local community agencies so they could provide assistance to recipients who needed help during the demonstration. A handbook for these volunteers covered the following topics:

- purpose of the handbook

- who is responsible for the demonstration

- how the EBT system works

- how recipients will use the benefit card to purchase groceries

- what to do about problems

- how to teach someone to use the benefit card

- where to call for help or additional information

The handbook explained that the training videotape and practice EBT equipment would be available to any organization wishing to provide additional training to recipients having difficulty with the system.

   Facilitators.   Facilitators provided assistance to both retailers and recipients during the first week of system operations.   They received their training by reviewing material covered during retailer and recipient training sessions, e.g., the BTT guide and the recipient handbook.   In addition, the FNS regional office distributed its checklists of questions to ask of retailers about problems encountered.

Training Logistics

   In addition to materials development, effective training requires attention to many logistical details.   Among the most important details are:

- who will conduct each training session

- how many people will be trained during each session

- how many sessions will be required

- when sessions will be scheduled (including follow-up efforts)

- the length of each training session

- the location of each training session

- procedures for notifying individuals about these training sessions

- installing equipment for the training

Reading Demonstration.   One logistic detail that merited special
consideration during the Reading demonstration was the scheduling of retailer
training.   All retailers had to be trained prior to system start-up so they
would be prepared to accept EBT sales once recipients began using the system.
However, if retailers were trained too far in advance of start-up, they might
forget what they learned before the system began operating.   Thus, retailers
were trained in a short time span immediately prior to system start-up.

Although PRC could have trained retailers in individual sessions at
each store, two factors led to the rejection of this approach.   First, a large
number of trainers would have been required to conduct individual sessions at
110 stores within a short time period.   Second, some stores did not have their
EBT equipment installed until just before system start-up, and PRC needed
equipment available during training to demonstrate its use.   Given these con-
straints, PRC opted to train retailers in group training sessions.   As de-
scribed in Chapter 3, retailers received several possible training dates
(from September 11 to 17) and called PRC to reserve space at a time convenient
to them.   Make-up sessions were held on September 27.

Arranging schedules for recipient training also required special at-
tention.   Food Stamp Program regulations require that recipients receive their
monthly benefits within 35 days of the prior monthly issuance.   Until re-
cently, Authorization-to-Participate cards were issued on the fourth work day
of each month in Berks County.   Meeting the 35-day requirement meant that re-
cipients converted to the EBT system had to be trained within about the first
10 to 12 days of the month.   Given a caseload of about 3,900 recipients to be
trained, PRC decided to train recipients over a three month phase-in period.
Training all recipients in a shorter time span would have required more train-
ing space than was available at the welfare office and also would have re-
quired more trainers and assistants.

The phase-in period for recipient training had the further advantage
of allowing more time to monitor system operations before the entire caseload
joined the EBT system.   As described in Chapter 3, system problems after
start-up led to the postponement of the third month of recipient training from
December 1984 to January 1985.

CHAPTER 6

REQUIREMENTS FOR SYSTEM IMPLEMENTATION

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REQUIREMENTS FOR SYSTEM IMPLEMENTATION

Once an EBT system prototype has been developed, successfully tested and approved by food stamp authorities, the process of implementing the full-scale system begins. Implementation activities include system installation and testing, installation of store equipment, training of participants prior to system start-up, and system start-up. Start-up activities include phasing participants onto the system, providing assistance to retailers and recipients, training recipients, monitoring system operations, and resolving system problems. Food stamp authorities participate heavily in many of these implementation efforts, even if they participate only minimally in design and development activities.

6.1 THE EBT SYSTEM MUST BE INSTALLED AND TESTED

The EBT system needs to be installed and thoroughly tested before it can begin operations. This test--called the System Acceptance Test in Reading--will be the final test of the system before food stamp benefits are distributed to recipients and used to purchase groceries. The test should therefore mirror the system's planned operating environment as much as possible. This means that functions to be performed by food stamp authorities and local financial institutions during operations should be handled by these same groups during the test. Furthermore, all system functions should be tested to ensure that the system is ready to begin operations.

Preparing for the Test

The system contractor must install all equipment necessary for system testing on site. This requires establishing at least one operations center to house computer equipment, tape libraries, spare equipment, and other supplies. (Depending upon actual system design, several operations centers may need to be established and linked together in a distributed network.) Point-of-sale (POS) equipment must be installed at several retail outlets for test purposes. Finally, the contractor must install any new equipment to be used at state and local welfare offices, as well as any equipment needed to access financial funds transfer networks.

In addition to the EBT equipment itself, any telephone lines needed to support the system must be in place. To prevent schedule delays, orders should be placed with the local telephone company well in advance of the test.

Everyone who will participate in the test must be trained, unless they were trained for the earlier test of the prototype. Recipients will use food stamp benefits to purchase groceries in the test; these benefits must be authorized in advance.

Finally, as with prototype testing, a test script and observation checklists should be prepared for the system test. Any problems noted with the script and checklists during the test of the prototype should be corrected and incorporated into the script and checklists for the system test.

Reading Demonstration. To prepare for the System Acceptance Test, PRC established the EBT Center within AB&T office space, installed the system's computer equipment at the Center, and installed EBT equipment in four additional stores. Equipment in one store and the EBT workstation at the Berks County Assistance Office had been installed for the earlier Functional Demonstration Test.

Shortly before the System Acceptance Test, PRC trained managers and clerks from the five additional stores on how to use the EBT equipment.

Finally, BCAO staff selected five food stamp recipients to participate in the test. Prior to the test, USDA established a special letter of credit for the issuance of bonus food stamp benefits to these recipients. Each recipient received $20 in benefits to use during the test. PRC trained the recipients during the second day of the test.

Conducting the Test

Activities performed during the system test are similar to those performed during the test of the prototype. As noted above, food stamp authorities and state personnel participate in the test, performing those functions required during system operations. Food stamp authorities (along with staff from financial institutions and the system contractor) also act as observers during the test.

The major difference between the prototype and system tests (in addition to having equipment located on site) is the number of system functions

tested. Some system functions may not have been checked during the test of the system prototype, but all functions must be tested before system start-up. The system test is the final opportunity to ensure that all system functions will work as designed when operations begin.

Reading Demonstration. The System Acceptance Test in Reading required three days to complete. The Functional Demonstration Test required more time (four days) because test observers and data files had to travel between Harrisburg, Reading, and McLean.

First Day. On the morning of the first day of the System Acceptance Test, the EBT Center loaded the system's Master File with 15 test records of recipient accounts. Operators then encoded store BICs for the four additional stores included in the test. After the BCAO encoded five test cards for processing dummy purchase transactions, observers traveled to two of the five participating stores and tested EBT activities. These activities included:

- BTT sign-on

- purchase transactions

- BTT lock-out for invalid PINs

- system check for invalid clerk IDs

- overring corrections (refunds)

- underring corrections

- manual sale authorizations

- BTT sign-off (with purchase totals)

Functions at the EBT Center and the BCAO workstation were tested during the afternoon. These functions included:

- reconciliation of temporary debits

- purchase of ATPs

- benefit card reissuance

- changing status on recipient accounts

- comparing display of retailer history with BTT journal tapes

- retailer bundle-up

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- tape formatting and procedures for processing retailers' deposits

After these tests, observers traveled to the five participating stores and tested the system's ability to process numerous transactions from multiple sites. Observers at each site simultaneously transmitted as many purchase transactions as they could within a short time period. Thereafter, they studied system reports tracking telephone line usage at the EBT Center to see whether or not the system's communication network had sufficient capacity to handle the incoming calls.

The final function tested the first day was system backup and recovery capabilities. This involved seven test purchases from one retail store. Three of the purchases were processed with both computers operating, and four were processed after shutting down the system's primary computer. After the seven transactions, the EBT Center synchronized the databases on the two computers and brought the primary computer back on line. Observers checked to make sure that all transactions had been properly processed and the system's Master File properly updated.

That night, the state welfare department created an issuance file containing issuance records for the five recipients selected for the test.

Second Day. On the morning of the second day of the test, the state electronically transmitted an issuance file to the EBT Center. The EBT Center acknowledged receipt of the issuance file, updated the system's Master File with the issuance data, and verified that the account records for the five selected recipients had been appropriately credited from the state's issuance file. PRC trained the five recipients, and BCAO personnel encoded their benefit cards.

After training, the recipients were driven to the store of their choice (from among the five stores participating in the test). All recipients purchased groceries using their EBT benefits. Food stamp authorities in all five stores observed the purchase transactions.

That afternoon, observers returned to the EBT Center and checked the system's processing of retailer bundle-up and system reconciliation. The EBT Center delivered the retailer bundle-up tape to AB&T and AB&T entered retailers' deposit information into the ACH network

That night, the ACH network transferred funds from AB&T's account to the bank accounts of the participating retailers.

Third Day. On the morning of the third day, AB&T sent a wire funds request for the sum of retailers' deposits to the Federal Reserve Bank in New York. After drawing down USDA's letter of credit at the United States Treasury, the New York bank credited AB&T's account. Test observers verified the above transactions. They then verified that retailers' EBT sales had been credited to their local bank accounts. This completed the System Acceptance Test.

Post-test Activities. As with the Functional Demonstration Test, observers for the System Acceptance Test noted several problems that needed resolution before FNS would accept the Reading EBT system. These problems, which are described in Section 3.4, included the need for further stress testing. In addition, no testing of the reconciliation procedures at the Minneapolis Regional Data Center had been performed. After PRC responded to these and other issues raised during the System Acceptance Test, FNS formally accepted the system.

6.2 PREPARING FOR SYSTEM START-UP

Once an EBT system is tested and accepted by the sponsoring agency, two major tasks need to be completed before system start-up. These tasks are installation of equipment in all participating stores and training of all system participants except recipients. Recipients may be trained after system start-up.

Equipment Installation

To ensure that the system does not disrupt recipients' shopping patterns, all stores participating in the system should be equipped before recipients begin receiving their EBT benefits. Because it may take months to obtain equipment, orders must be placed well before expected installation dates. Installation orders for telephone lines also should be placed well in advance of scheduled equipment installation.

The time and effort required to install the store equipment will depend on the number of stores in the system. Installation may take longer or require more technicians as more retailers are included in the system, and equipment vendors may need longer lead times with larger orders. The size of the geographic area to be served also may affect installation schedules; with larger areas, more time will be needed to travel to outlying stores.

Reading Demonstration. Store equipment (i.e., BTTs, PIN-pads, and printers) had to be ordered during the development phase to be available in time for implementation. Orders for additional telephone lines (and extensions of existing lines) were placed immediately after FNS authorized PRC to implement the system. With telephone lines installed, PRC field technicians installed and tested the EBT equipment. As described in Section 3.4, store managers signed receipts for the equipment and agreements to abide by demonstration regulations as equipment was installed. Managers also provided information necessary to establish ACH accounts for the transfer of deposits to their stores' bank accounts.

PRC required about seven weeks to install equipment in 93 stores prior to the start of system operations. Another 17 stores were equipped during the first week of system operations. Because PRC (and the telephone company) had trouble meeting the installation schedule, PRC did not install balance-only terminals until after system start-up. This experience suggests that installation schedules be carefully reviewed in future applications of EBT systems. Because some installation problems cannot be anticipated, it is probably wise to provide some additional time in the schedule to avoid the disruptions caused by installation delays.

Training

Many different groups of system participants need to be trained prior to system start-up. At a minimum, these groups include system operators, store clerks and managers, staff from the local welfare office(s), and instructors for recipient training sessions. In addition, if volunteers from local community agencies or other personnel will provide assistance during start-up of system operations, these groups need to be trained.

Training sessions for the above groups should be held as close as possible to the system's start-up date. The shorter the period between training and start-up, the less time individuals have to forget training instructions. In addition, if training occurs too early, any "last-minute" decisions to change operating procedures will not be reflected in training materials.

Reading Demonstration. As described in Section 3.4, training of all participants in the Reading system (except recipients) occurred in September 1984, the month preceding system start-up. The tight training schedule was further strained when PRC needed to conduct make-up training sessions for retailers who had missed the original sessions. Given the necessity of finishing all training prior to the start of system operations, future implementation plans should incorporate some time for additional training sessions, if needed.

Because all store managers and clerks had to be trained within a short time before system start-up, PRC trained retailers in group sessions rather than individual sessions in each store. Each group session lasted about one hour and included a maximum of 20 retail staff. The retailers were reasonably satisfied with the training. In interviews with store owners or managers in October-December of 1984, 33 percent believed that their employees had been trained "extremely well," and 50 percent believed they had been trained "adequately." About 17 percent believed that their employees had been trained "not well at all." These managers criticized the sessions as too brief (39 percent) or too complicated (22 percent). Some criticized the instructor's presentation (19 percent). When asked what should have been done differently, respondents who were unhappy with the training most often suggested longer sessions and better hands-on experience in working with the EBT equipment.

6.3 SYSTEM START-UP

The final implementation step is system start-up. Start-up activities, which may extend over a considerable period, include phasing participants onto the system, providing assistance to retailers and recipients, monitoring the system to identify operating problems, and resolving problems identified during start-up.

System Phase-in

An EBT system can be envisioned in which all participants have access to the system immediately after start-up. This implementation strategy, however, would require extensive resources to train all retailers and all recipients prior to start-up. Futhermore, with a system working immediately at full capacity, any system problems could cause major disruptions for retailers and recipients.

An alternative strategy is to bring the system to full capacity in phases. Not only does this provide more time for training, it also provides time to correct system problems while the system operates at less than peak loads.

One phase-in strategy is to have all retailers participating at start-up, with recipients added to the system in phases. This strategy has the advantage of operating all parts of the system while loading it in incremental stages. If system problems arise during phase-in, they cause fewer problems at retail outlets because fewer recipients use the system. An incremental start-up also provides system operators and food stamp authorities more time and flexibility to monitor operations, identify problems, and devise corrective actions. For example, if the average monthly number of recipient transactions exceeds design expectations, this should become apparent well before all recipients join the system. Actions then can be taken to increase system capacity or otherwise prepare for subsequent peak loads.

If an EBT system covers a large area, it may be impractical to have equipment installed in all stores before any recipients begin using their benefit cards. In this situation, separate counties or shopping areas served by the system could be added in phases. Again, to avoid disruption of shopping patterns, all retailers in any given area should be equipped prior to training recipients in that area. Depending upon resources needed to train recipients, recipients in each area could be trained either in phases or all at once.

Regardless of which implementation strategy is chosen, it should be recognized that the number of grocers participating in an EBT system will not be fixed over time. Some stores in the system may close, lose their eligibility to participate in the Food Stamp Program, or decide to drop out of the

system. In addition, new stores desiring to participate may open, or store managers who originally declined to participate may change their minds.

Reading Demonstration. The Reading demonstration adopted a phase-in strategy. All retailers were supposed to be ready to process transactions on October 1, 1984, to avoid disruption of recipients' shopping patterns. (Although, as noted above, installation delays prevented some stores from being equipped until shortly after start-up.) Recipients were to receive training and join the system in three phases over three consecutive months. However, as described in Section 3.4., system problems occurred after start-up, and the third wave of recipient training was postponed one month to provide PRC and FNS more time to address these problems.

Between the initial enrollment period and system start-up, about 20 stores expressed a desire to participate in the EBT system. PRC did not have sufficient time or authorized funding to equip these stores prior to start-up. These stores lost food stamp sales until they joined the system in February and March 1985, which undoubtedly created some negative attitudes about the system. Future implementation plans for EBT systems might focus on establishing procedures for authorizing and equipping additional stores as quickly as possible.

Training Recipients

Food stamp recipients are the largest group of participants to be trained during start-up. Moreover, households will enter the Food Stamp Program continuously, and these new households must be trained. An EBT system changes the procedures recipients use to purchase groceries with their food stamp benefits, and the sponsoring agency (or a contractor) must provide thorough instruction to recipients on how to use the new system.

Training should be sufficiently detailed that recipients know exactly what to do when they go to retail outlets to purchase groceries. Confusion about proper procedures can cause delays at checkout counters, a situation which retailers spend substantial effort to avoid. Thus, in addition to telling recipients how to purchase groceries with the new system, training sessions should include hands-on experience with the equipment they will find in the store. Practice sessions during training will familiarize recipients with EBT equipment and purchase procedures.

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Training also should cover all non-purchase procedures recipients need to know. For instance, procedures for obtaining account balances and for reporting problems with benefit cards should be explained. If the EBT system requires the use of PINs to maintain secure access to program benefits, training sessions should stress the importance to recipients of keeping their PIN a secret.

Training should accommodate any special needs of subgroups of the food stamp caseload. If the recipient population includes recipients who do not speak English, interpreters should be available during training sessions. Extra assistance should be available for recipients with other needs. For example, this assistance may take the form of providing transportation to training sessions for the elderly or physically handicapped. In addition, recipients with emotional or mental handicaps may need individualized instruction.

When scheduling training sessions for recipients, the local welfare office should notify all recipients when and where their training sessions will be held. If recipients need to bring any materials to the sessions, this should be specified when recipients are notified of their training sessions.

Reading Demonstration. Staff from the state welfare department and the Berks County Assistance Office conducted all training sessions for demonstration recipients during system start-up. As discussed in Chapter 3, recipients trained at the BCAO in group sessions held during the first 10 to 12 days of each of three months. This schedule enabled each wave of recipients to receive their EBT benefits within 35 days of the previous month's food stamp issuance, as required by program regulations. Chapter 5 describes material covered during training sessions.

Although recipient training generally proceeded smoothly in Reading, some problems occurred which have implications for future applications of EBT systems. The major problem experienced was the postponement of the third wave of training from December 1984 to January 1985. Although the postponement decision related to system problems rather than training difficulties, it had some repercussions on training. For instance, because state personnel from Harrisburg conducted training sessions in Reading with the assistance of BCAO staff, the state staff needed to adjust their schedules so they could return to Reading in January to finish training.

Because all elderly recipients in the demonstration area were scheduled for the third wave of training, state and local food stamp personnel worried that bad weather conditions in January might create difficulties for recipients trying to go to the welfare office for training. Indeed, the state suggested postponing training until April. Although the schedule for the demonstration precluded adopting this suggestion, this points out some of the factors that officials considered when scheduling training sessions for recipients.

In addition, training procedures for afternoon sessions in January were changed to reduce loads on the system during peak shopping hours. Instead of encoding recipients' benefit cards during training (which required system processing), staff encoded cards overnight. This change required recipients to come back the following morning to pick up their encoded cards.

Recipients who failed to appear for their scheduled training sessions created another problem. Over the three months of training, 564 recipients (or 14 percent of the approximately 3,900 recipients scheduled for training) failed to come to their originally scheduled training sessions. Make-up sessions were scheduled for these recipients, and 204 came to these sessions. Of the remaining 360 recipients, about 150 (or nearly four percent of all recipients in the demonstration area) had their food stamp cases closed as a direct result of their not appearing for training. The other 210 recipients did not appear for training because they had moved out of the demonstration area or their food stamp cases had been recently closed for other reasons.

Recipients who failed to appear for training forfeited the benefits placed in their EBT accounts prior to training. This created an additional task for intake workers at the BCAO. To ensure that the forfeited benefits could not be used at a later date if the recipients reapplied for benefits, intake workers checked existing case records for each new applicant. If the applicant had failed to appear for training, then benefits in the existing EBT account were drawn out and returned to the state before new benefits were issued.

Despite the above problems, recipient training in Reading generally proceeded smoothly. A survey of demonstration recipients asked recipients how

satisfied they were with their EBT training. About 68 percent said "very satisfied," and 27 percent said "somewhat satisfied." Less than one percent said they were "not satisfied at all."

Very few recipients (six percent) indicated that they needed information that had not been provided in their training session. Despite the state's effort to schedule all Spanish-speaking recipients in sessions with a Spanish interpreter, three of the 17 individuals who identified some additional need said they needed a Spanish interpreter. Most of the other items mentioned by those recipients needing more information were actually covered in the training sessions, but had apparently been missed by the individual respondents.

Part of the success of recipient training in Reading may be attributable to the additional efforts taken to train recipients with special needs. During the distribution of photo identification cards, state and local food stamp staff observed all demonstration recipients and tried to identify all who were elderly, Spanish-speaking, or emotionally, mentally, or physically handicapped. These recipients were scheduled for the third month of training. So that trainers could provide more assistance to these recipients, their training groups were smaller. In addition, BCAO staff monitored the EBT activitity of a small number of these recipients who had difficulty with training, to be sure that the recipients used their EBT cards to access their benefits. Although staff were prepared to provide additional assistance to any recipient not using his or her account, this proved unnecessary.

Providing Assistance to Retailers and Recipients During Start-up

Retailers and recipients will not be accustomed to using an EBT system when operations begin. In addition, problems are bound to occur when a complex computer system like an EBT system first starts operating. To help operations run more smoothly during this period, the sponsoring agency or the system contractor should provide extra assistance to retailers and recipients.

Reading Demonstration. To identify system problems and provide assistance during system start-up, about 20 USDA staff from the regional and field office serving Reading acted as facilitators during the first week of operations. PRC trained these facilitators before system start-up.

The facilitators were organized into two groups. One group visited each store participating in the demonstration to observe EBT operations and to ask retailers about their problems. The other group remained at the EBT Center and responded to calls from retailers or recipients experiencing difficulties. Although the facilitators noted some minor difficulties with store equipment and reported these problems to the EBT center's field technicians, no major problems occurred during the first week of operations.

Monitoring System Operations

The system contractor and the sponsoring agency need mechanisms for staying abreast of system operations so that problems can be identified quickly and corrected. Procedures therefore should be established to monitor system activities and to obtain comments from system participants. Because most software and hardware problems in the system are likely to appear shortly after start-up, monitoring is especially important during this period.[1] However, problems can arise even after a start-up period, and monitoring procedures should continue throughout the duration of system operations.

One monitoring tool is the set of reconciliation reports specified in the system design requirements. If the reconciliation reports reveal imbalances in the system's accounts, then a very serious problem may be present in the system's basic design. The reconciliation reports will indicate to some degree the nature and location of the problem. They also may help identify an appropriate solution to the problem.

Management reports provide a second means of monitoring system activities. These reports should be designed to provide timely information on all system activities and performance levels. Especially during any system phase-in period, summary data on the number, dollar value, and types of transactions being handled by the system can indicate whether or not the system's data

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[1]To a certain extent, the facilitators used in the Reading demonstration helped monitor the system during its first week of operations. The facilitators, however, concentrated on problems apparent in retail stores. Many other problems could occur, e.g., improper debiting of recipient accounts, delays in crediting retailer accounts, and operator errors in running the system. Thus, monitoring procedures need to be more encompassing than the functions performed by the Reading facilitators.

files have sufficient capacity to handle the full caseload after phase-in. If the reports indicate a potential problem, it can be corrected before the system's capacity is exceeded.

In a similar manner, management reports during phase-in can summarize the time the system takes to process individual transactions. Extrapolating these performance measures to conditions after the entire caseload is on the system can forewarn the contractor and sponsoring agency of potential capacity problems with transaction processing. Again, early identification of potential problems provides more time to devise corrective actions.

Finally, management reports can indicate areas in which retailers or recipients experience difficulty dealing with the system. For example, depending on the design of the system and its data files, reports might indicate how often recipients have trouble using their PINs, how often recipients have insufficent balances to cover intended purchases, and how often retailers need to resort to manual sale procedures. As described in Chapter 4, however, different situations can sometimes lead to identical information being presented in management reports, making the reports difficult to interpret. To prevent these report problems, reporting requirements must specify exactly what information is needed, and the requirements must be established early in the design phase so that the system and its data files support the requirements.

In addition to regular management reports, activities should be periodically monitored at the following locations to ensure compliance with all operating procedures: the local operations center, retail outlets, state and local welfare offices, and local financial institutions. Because recipients, retailers, local food stamp personnel, and local bank personnel probably will be in the best position to know when and under what circumstances certain problems with the system may be occurring, procedures for gathering feedback from these groups also should be implemented.

Finally, in addition to establishing monitoring procedures, the sponsoring agency and system contractor need to allocate sufficient resource: to evaluate and act upon information gathered during monitoring. This task can require extensive effort. For instance, even well-designed system operations reports are likely to be voluminous and very time-consuming to read and interpret. In addition, reports may include errors or ambiguities, and tracking down such problems may require substant of effort.

Reading Demonstration. FNS and PRC use all the above procedures to monitor system activities. Operators at the EBT Center check system reconciliation reports daily, and FNS (through its Regional Data Center in Minneapolis) reconciles weekly system activities against drawdown of USDA's letter of credit at the United States Treasury. At the end of each month, FNS and PRC examine management reports summarizing monthly activities. FNS staff also spend several days each month observing operations at the EBT Center and at retail stores. In addition, FNS staff asked retailers to notify them (as well as the EBT Center) of problems encountered with the EBT system. Finally, they asked PRC to notify them whenever the system's computers do not function for more than five minutes or a bundle-up is not processed on the scheduled day.

These monitoring activities have identified many problems with system operations. For example, daily reconciliation activity discovered the system's inability to accept more than one issuance of benefits for a single household on the same day. Another example is that monthly management reports discovered that recipients were using the system more than PRC had expected. Thus, this documentation, coupled with reports from retailers of system slow-downs, forewarned FNS and PRC of problems with system capacity and processing speeds well before the entire demonstration caseload joined the system.

By monitoring system operations several days each month, FNS identified several improper actions that retailers take to circumvent system problems. For instance, although retailers are supposed to request manual sale authorizations only when the system is down or their store equipment is not functioning, retailers occasionally request manual sales when recipients cannot remember their PINs, when recipients' EBT cards are damaged, and when system processing of sales transactions is slow. To avoid the $35 limit on manual sales, some retailers request multiple manual sale authorizations for a single sale or hold recipients' cards for later processing when the system operates.

The examples cited above illustrate only those problems identified through system monitoring procedures. Chapter 3 discusses other system problems. It should be noted here, however, that the Reading monitoring procedures have themselves experienced problems. The reconciliation and management reports are sometimes inaccurate. Furthermore, some management reports are ambiguous because they cannot distinguish among multiple situations which can

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lead to the same system outcome. An example is the "insufficient balance" report, which has been described earlier.

Resolving Problems

Unless EBT systems become standardized and less dependent on customized designs, any EBT system is likely to experience problems after it begins operations. In addition to establishing procedures for identifying these problems, the system contractor and the sponsoring agency need to develop procedures for correcting the problems.

The first issue to resolve is whether or not a problem really exists. Unless performance criteria have been specified for the system, the system contractor and the sponsoring agency may disagree about whether some aspects of system operations meet minimum performance levels. Disagreements at this level require substantial effort to work out, and they may require expensive contract modifications before resolution. Specifying system performance criteria at the start of a contract should avoid many such disagreements.

Once a problem is identified, the system contractor will normally be responsible for correcting the problem. Sometimes, the solution may be obvious and easy to implement. Often it will not. When faced with the latter type of problem, the system contractor may propose more than one action to correct the problem. If not, the agency may wish to request information on other possible remedial actions. Various solutions will have different likelihoods of correcting the problem and different costs. "Costs" include both monetary costs and the possible limits on system operations needed to implement a proposed solution.

When the system contractor proposes a range of possible solutions to a particular problem, the sponsoring agency needs to evaluate each proposal in terms of its costs, its likelihood of success, and the time needed to implement the proposed solution. The agency may need outside technical assistance to perform this evaluation. Any outside consultants used for this purpose should be familiar with the capabilities of the specific hardware and software chosen for the system. The outside consultants should inform the agency which options, if any, are reasonable, given the nature of the problem. They also may suggest options other than those proposed by the system contractor.

Reading Demonstration. Problems experienced in the Reading demonstration have been described in Section 3.4. In general, the major problems were attributed to the system's slow processing of batch jobs (leading to system slowdowns), hardware failures, inefficient or inaccurate software, and operator errors. Because problems encountered in another EBT system may differ substantially from those experienced in Reading, the solutions implemented in Reading (also described in Section 3.4) may not be generally applicable. Nevertheless, the Reading experience suggests approaches and options that a sponsoring agency might consider.

The system slowdowns experienced in the Reading system offer a good example of a serious problem with several possible solutions. Corrective actions proposed by PRC included upgrading hardware, improving system software, modifying store equipment, and changing operating procedures. To assist in its evaluation of the proposed modifications (as well as proposed solutions to other system problems which developed in Reading), FNS hired an outside consultant to evaluate the Reading EBT system and PRC's proposals for improving system operations. Ultimately, FNS authorized some elements of each proposed modification. Given the demonstration nature of the Reading EBT system, however, FNS focused on low-cost actions relatively easy to implement. For instance, rather than authorizing an expensive upgrading of the system's secondary computer, FNS authorized the following actions:

- adding more disk storage capacity for the system

- making software changes to improve the speed of transaction and batch processing

- modifying EBT equipment in the five busiest stores so that the equipment would wait longer for the system to respond before cancelling a transaction request[1]

- establishing two issuance days each month

- delaying retailer bundle-up from the afternoon peak shopping hours to early evening to reduce afternoon loads on the system

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[1]Cancelling a transaction request slows system processing. This slowdown occurs because system resources are directed to backing out cancelled transactions.

Because AB&T had its own deadlines for processing retailer bundle-up infor-mation before entry into the ACH network, this latter action also required agreement from AB&T.

To help resolve problems, FNS and PRC met weekly to discuss system operations, problems encountered, and proposed remedial actions. Monthly meetings were also held with staff from the state and local welfare offices. These meetings provided a forum for discussions about the feasibility of pro-posed actions and how the "solutions" might adversely affect system partici-pants or other system operations. Thus, before PRC implemented any major changes to the system, system participants had the opportunity to review and discuss the consequences of the actions.

CHAPTER 7

LESSONS FROM THE READING EBT DEMONSTRATION

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LESSONS FROM THE READING EBT DEMONSTRATION

Because the Reading EBT demonstration is still in progress, it is premature to evaluate how well the system operates or how it affects demonstration participants. Nevertheless, it is appropriate to discuss some of the lessons learned thus far.

The chapter contains seven sections. Sections 7.1 and 7.2, respectively, discuss problems in system design and system operations that became evident during the demonstration. Because some of these problems manifest themselves during peak shopping periods, when loads on the system are at their highest, Section 7.3 discusses what has been learned about patterns of benefit usage. Sections 7.4 and 7.5 present retailers' and recipients' observations about the Reading EBT system. These observations point out the perceived weaknesses and strengths of the system. Section 7.6 presents some of the lessons learned about supervising the design, development, and implementation of an EBT system. Section 7.7 presents a summary of issues to be addressed when establishing an EBT system.

7.1 PROBLEMS WITH SYSTEM DESIGN

The Reading EBT system generally performed the benefit authorization, issuance, and redemption functions specified in the original solicitation. Each month, benefits have been credited to recipients' accounts, and recipients have been able to use their EBT benefits to purchase groceries. Retailers' bank accounts have been credited for the value of sales made to demonstration participants.

As described in Chapter 3, however, the system experienced some problems since operations began in October 1984. Some of these difficulties can be attributed to system design elements. Some of the problemmatic design decisions can, in turn, be traced to the absence of system performance criteria, which is discussed in Section 7.6. Recognition of both sets of problems may improve the design of future EBT systems.

System Slowdowns

During the implementation period, the major problem in the Reading demonstration has been the numerous occasions when retailers and recipients have waited for purchase transactions to be processed. System crashes have caused some delays. At other times, from the user's point of view, the system is simply slow: slow to accept telephone connections and slow to process transactions. These latter delays cannot be attributed to any single design element. Rather, the slowdowns occur when several factors coincide to produce slow processing speeds within the system. This suggests that the system could be improved by addressing any one or a combination of these factors. Indeed, PRC's suggestions for improving system service cover a variety of design elements.

The design factors contributing to system slowdowns are:

- the need to perform batch processing job (e.g., retailer bundle-up) during peak shopping hours

- the need to provide system backup by operating two computers in tandem

- the decision to design the system's software to execute all messages between the two computers sequentially rather than in parallel

- the decision to use PL/1 as the system's programming language

In addition to the system design factors, heavier-than-expected patterns of benefit usage have contributed to system slowdowns. These patterns are discussed in Section 7.3.

The system's two IBM Series/1 computers are very efficient at receiving and processing transactions from the field. However, they do not process batch jobs (i.e., functions that involve handling many file records) as efficiently. Thus, whenever a batch job needs to be run, the system lacks capacity to process the batch job and rapidly process transactions from the field at the same time. This points out the need to select equipment which maximizes the efficiency of all major system operations.

PRC's response to this problem has been to schedule batch jobs during off-peak hours, insofar as possible. Examples are the system daily reconciliation reports (run at night) and the end-of-month management reports (run on weekends). Until April, however, PRC had to run retailer bundle-up during the afternoon to meet AB&T's processing deadline of 4:30 PM. This contributed to system slowdowns. In April, AB&T added an 8:30 PM processing deadline. The EBT Center then delayed bundle-up until early evening. PRC also initiated some software changes that have enhanced batch processing. In the last few months, the incidence of system slowdowns has diminished.

Even with the earlier bundle-up period, however, system slowdown problems often were avoided or diminished by decoupling the two computers. When the computers operate in tandem, messages must be relayed between them to update the second computer's database. These additional messages increase processing time. Decoupling the second computer is an easy way to reduce processing time and improve the system's efficiency. Decoupling, however, seriously diminishes the backup capacity of the system.

Compounding the above problem, PRC designed the system's software so that the messages relayed between the computers were executed sequentially. This software design was chosen to enhance the system's security and reliability, albeit at a loss of efficiency. In response to the system slowdown problems, PRC changed the software to incorporate some parallel processing of internal messages.

Finally, as discussed in Chapter 5, PL/1 is less efficient at instructing the system's computers than other available programming languages. Unlike the other design elements discussed above, changing a system's programming language is a major task. It would require that all system software be rewritten and retested. Therefore, no suggestions for system improvement contemplated changing the system's programming language. In future applications of EBT systems, however, another language might be more appropriate. The selection of a programming language should consider its efficiency, its effect on software deveopment costs and scheduling, and its certifiability as a programming language for use on a government project.

System Backup

As previously described, the Reading system uses two computers operating in tandem to increase system reliability. This allows each computer's database to be updated during transaction processing. Then, if the primary computer fails, all processing can be switched to the second computer without the need for a time-consuming update of the second unit's database.

The original design anticipated that the above switch could be achieved automatically, without operator participation. PRC subsequently learned, however, that an automatic switch could not be performed with the hardware selected for the system. Therefore, to prevent delays in the event of a failure within the primary system, the EBT Center is staffed on a 24 hour basis. Otherwise, if the primary computer fails, the entire system will be down until an operator can go to the Center and perform the switch.

Manual Sales

To maintain service reliability, any EBT system must provide a means of handling purchases when the system is down or otherwise inaccessible to retailers. For the Reading EBT system, PRC designed an authorization procedure for manually authorizing sales when the system is inaccessible.

The procedures for authorizing manual sales are cumbersome. Retailers must call the EBT Center; the operator at the Center must check the recipient's account balance before giving authorization; and the retail clerk must fill in a manual sales form. The retailer's account is not credited until a copy of the sales form is sent to the EBT Center and reconciled. These procedures consume time, and retailers do not know exactly when their accounts are credited. This uncertainty makes retailers' reconciliation of sales and credits to bank accounts difficult. Often the retailer must call the EBT Center to find out when the sale is finally credited.

As discussed later in this chapter, retailers perceive the manual sales procedure as a major weakness in the EBT system design. In future applications, new approaches may have to be initiated to ensure system acceptance by the retail community. Of course, a better solution may be to improve system reliability, thereby reducing the need to use manual authorization procedures.

Grocer Reconciliation

To reconcile sales with credits to their bank accounts, retailers need to be able to track sales for a time period corresponding to the time for which accounts are credited. The Reading system uses a bank day (2:00 PM to 2:00 PM) as this time period.

The decision to use the bank day for bundling and crediting retailers' sales has the advantage of reducing to one day the time between a sale and its subsequent crediting. Retailers, however, have difficulty tracking sales under this system, and view this feature of the Reading system design as a problem. One possible solution is to use a calendar day for accounting purposes, but this would increase the time required to credit retailers' bank accounts to at least two days. Another solution is to provide a mechanism which relays information on sales for the banking day back to the retailer. Although the Reading system does track sales for each banking day, no formal mechanism exists for transmitting this information to retailers. Some retailers have taken the initiative of calling the EBT Center or AB&T to get this information. This is time consuming, and it places an additional burden on personnel at the bank and the EBT Center.

7.2 PROBLEMS WITH SYSTEM OPERATIONS

In addition to the design problems described above, the Reading EBT system experiences operating problems which have reduced system service. Although any system experiences some operating problems, the problems identified in the Reading system suggest some approaches which can be taken to reduce them.

Equipment Malfunction

The equipment at the EBT Center occasionally malfunctions. From October through February, equipment problems caused the system to be inaccessible to retailers on at least ten occasions, for a total of about 15 hours. Although most of this downtime occurred during off-peak hours, even brief periods of inaccessibility during normal shopping periods can lead to unacceptably long delays at checkout counters. Some of the specific equipment

problems at the EBT Center are described in Chapter 3. However, an enumeration of these problems will not help future applications of EBT systems; different pieces of equipment would likely be subject to different malfunctions.

One exception to this is the Voice Input/Output unit used for responding to balance inquiries from touch-tone telephones. This unit malfunctions often. Although it is not clear at this time whether the problem is with the unit itself or the software controlling the unit, future systems may wish to avoid using this particular piece of hardware unless the unit's problems are identified and corrected during the course of the demonstration.

In addition to equipment at the EBT Center, problems also occur with the equipment in retail stores. During the first five months of operations, the EBT Center received about 200 calls from retailers reporting equipment problems. About 72 percent of the problems were traced to improper use of the equipment rather than actual equipment malfunction. Examples of such problems include jammed printers (due to incorrect replacement of printer paper), BTT handsets being off their hooks, and loose power connections. The remaining problems required equipment repair or replacement. In addition to these service calls, PRC modified all store BTTs in January to prevent the conversion error problems described in Chapter 3 (i.e., BTTs transmitting alpha characters instead of numeric characters to the EBT system, resulting in system crashes).

Some of the above problems might be avoided or reduced either with better retailer training or with minor modification to the equipment itself. For instance, more secure plugs might reduce the incidence of loose power cords. In addition, more attention could be given during training on how to install paper and how to diagnose and fix minor equipment problems. (In this regard, PRC sent a letter to retailers late in October telling them what types of problems seemed to be occurring most frequently and how to fix the problems). System operators, however, should be alert to the fact that problems like those described above may occur fairly regularly, and that the contractor must be prepared to provide necessary assistance to keep the equipment operating.

Operator Short-cuts and Errors

Some of the system problems experienced by the Reading EBT system result from mistakes by operators at the EBT Center. Examples include forgetting to initialize new tapes, entering the wrong date or time when resetting the system after a system crash, forgetting to replace backup diskettes prior to peak sales periods, and trying to run batch programs in the wrong sequence. As long as a system design requires operator intervention to run the system, errors similar to those listed above will occur. To minimize their occurrence, careful attention needs to be placed on operator training and supervision. Operator training also should be scheduled so as not to interfere with normal system operations. Finally, the provision of clear and detailed operating manuals should reduce the frequency of operating errors.

Without close supervision, system operators also may be tempted to take short-cuts while running the system. Although short-cuts do not necessarily lead to service disruptions, the potential for serious problems increases if operating instructions are not followed closely. In Reading, for example, operators sometimes fail to sign-off the workstation when they leave the work area for brief periods. By leaving the workstation on and unattended, the security of the system and its files may be diminished. (In the EBT Center, however, physical security of the entire area is maintained at all hours.)

In another example of a short-cut, the state welfare department does not always encrypt supplemental issuance data transmitted to the EBT Center. To encrypt the data, the operator must manually reset the data encryptor and modem, which are located under the raised floor of their computer center. The lack of easy access to this equipment has caused state personnel to avoid regular encryption of data, again reducing the security of the system.

To the extent that system design can reduce the amount of needed operator intervention, the potential for errors and short-cuts diminishes. For instance, the state's data encryptor and modem could be relocated, or an easily reached switch could be installed. Minimizing the required handling of tapes or diskettes also might reduce the incidence of operator error. Such design solutions, however, may require additional or most costly equipment. Thus, system designers must weigh any tradeoffs between reductions in operator error and increases in system costs.

7.3 PATTERNS OF BENEFIT USAGE

Designers of an EBT system must make assumptions about the expected pattern of benefit usage in the system. The expected volume and timing of purchases affect the system's design in terms of needed file capacity, the number of telephone lines needed to handle calls to the system, and required processing speeds.

In planning for the Reading demonstration, PRC had little information about the number of purchases a food stamp recipient would make in a month. PRC assumed that food stamp households would average five EBT purchase transactions per month. Through the first four months of operation, however, the household average was about eight purchases per month. In February—a short month—the average was seven purchases.

Even less information was available about the timing of recipient purchases. It was expected that peaks in purchase activity would occur. In planning for telephone usage, PRC assumed that the peak hourly volume of transactions during the month would be about 167.[1] This number amounts to 0.8 percent of the assumed monthly purchase volume of 20,000 purchases.

In February, the peak hourly volume was 284 purchase transactions. This peak is 70 percent greater than PRC's assumed peak volume, and it represents 1.2 percent of February's 23,537 regular purchases. Three factors contributed to the unexpectedly high peak volume: demonstration households averaged more than the assumed five purchase transactions during the month; households concentrated many of their purchases on the days immediately after issuance; and households concentrated their shopping in the late afternoon hours of the day. The actual peak occurred between 4 and 5 PM on February 6, two days after issuance.

The heavier-than-anticipated peak demands on the EBT system contributed to system slowdowns. The slowdowns were concentrated during afternoon shopping hours and the first few days of each issuance cycle. Two lessons emerge from these experiences. First, system planning must be based on the

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[1]Derived from assumptions in Erlang queuing equation in _Electronic Benefit Transfer System: Detailed System Design_. McLean, VA: Planning Research Corp., 1983, pp. 3-18.

most accurate possible knowledge of recipients' patterns of benefit usage. The statistics available from Reading will be helpful in this regard, but it cannot be assumed that the Reading experience reflects shopping behavior in other locations. Thus, information specific to the planned EBT site should be developed. At a minimum, retailers in the area with a large volume of food stamp sales should be contacted during the design phase for information about peak purchase periods.

The second lesson is that an EBT system needs "excess" capacity--that is, it should be designed to handle more than the expected number of recipients and transactions. Requirements for system capacity also must consider other EBT functions requiring computer resources. Some of these (like bundle-up in the Reading system) may interact with patterns of benefit usage. Others (like card encoding or issuance updates) may be unrelated to peak shopping hours.

Excess system capacity will provide a cushion in the event actual usage exceeds expected usage. How much extra capacity to provide requires an analysis of the cost of providing the capacity, the likelihood that extra capacity will be needed, and the costs and problems involved if initial capacity must be expanded after system implementation. It may also be possible, of course, to meet system capacity requirements by reducing peak loads on the system rather than by increasing system size. Given the pattern of benefit usage observed in Reading, staggering issuance dates may be a particularly cost-effective method of meeting capacity requirements. The state welfare office implemented staggered issuance in July 1985, and the impact of this change on peak volumes in Reading will be assessed in a later report.

7.4 RETAILERS' OBSERVATIONS ABOUT THE READING SYSTEM

Retailers' Expectations

Planners of the Reading EBT demonstration feared that food retailers would oppose the electronic system and stop participating in the Food Stamp Program. Historically, the retail food industry has been slow to adopt point-of-sale debit or credit card systems for two main reasons. Because the industry operates on very narrow margins, a retailer cannot pay a service or transaction fee without risking either a loss of profits or a non-competitive price

structure. Second, shoppers are very sensitive to the length of time they spend waiting in the checkout line, and a system that slows a store's checkout process may send customers elsewhere.

In establishing the demonstration, therefore, PRC worked hard to win support from the Reading grocers. The process of public meetings and other events is described in Chapter 3. The results were quite positive: virtually all retailers in the demonstration area who are authorized to participate in the Food Stamp Program elected to participate in the demonstration project.

In addition to PRC's efforts, three other factors clearly influenced the grocers:

- Any store that did not participate in the demonstration would almost certainly lose revenues, because all food stamp recipients in the demonstration were able to use their benefits only through the EBT card. (Stores were allowed to continue accepting coupons, so they did not have to fear losing the business of food stamp recipients living outside the demonstration area.)

- The EBT system required few direct expenditures by the retailers. Although retailers had some costs (such as the cost of training clerks and the loss of counter space), the in-store equipment, communications, and transaction costs were borne by the Department of Agriculture.

- Because virtually all stores in the Reading market area participated in the demonstration, no participating store would necessarily face a change in competitive position.

Thus, a retailer stood to lose more by not participating in the demonstration than by participating.

Although virtually all retailers decided to participate in the EBT demonstration, their expectations were mixed.[1] Most believed that the system would be easier to deal with than the coupon system. Asked whether they thought the EBT system would be easier or harder to deal with than the coupon

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[1] Interviews were conducted with managers or owners at a total of 110 participating retail establishments before the EBT system began operating. Most of the interviews were conducted in June and July; 1 interviews were conducted in the September-October period with grocers who made the decision to participate in the demonstration between July and the start-up period in October.

system, 67 percent said easier and 14 percent said harder. The retailers looked forward to a reduction in the time and effort spent counting, cancelling, and bundling coupons for redemption.

Grocers foresaw general improvements in the Food Stamp Program as well as efficiency gains for their own operations. Asked what they saw as the major benefits of the EBT system, the main responses were:

- elimination of coupon handling, efficiency in processing (31 percent of all responses)

- reduction in fraud and abuse of coupons (29 percent)

- not having to give change in food stamp purchases (17 percent)

- efficiency of direct deposit to bank (12 percent)

- improvements in recipients' buying patterns, such as spending all of their benefits on food, spreading purchases out through the month (4 percent)

Perhaps the most surprising aspect of these responses is the emphasis on the EBT system's ability to curtail fraud and abuse. A second interview asked the grocers about the frequency of various kinds of abuse.[1] They felt that the most frequent abuse was for recipients to make repeated small purchases in order to generate cash from their coupons[2] (63 percent of respondents). More than a third of the respondents mentioned the purchase of prohibited items and the sale of coupons for cash as frequent abuses. An overwhelming majority of the retailers (73 percent) felt that the EBT system would reduce food stamp fraud and abuse "a lot." Only 11 percent felt that it would have no effect or expressed no opinion.

The retailers also were asked what they saw as the EBT system's major drawbacks. A substantial 18 percent could not think of any drawbacks (compared to only 6 percent who had seen no major benefits). Among those who did name drawbacks, the most common responses were:

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[1]The second interview was conducted in August and September, 1984, just before the EBT system became operational.

[2]Recipients can receive no more than $0.99 in change from any one purchase.

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- recipients would have problems with the system, such as forgetting their PIN, or having insufficient benefits to cover their intended purchase and having to leave items for reshelving (28 percent of those responding)

- the EBT system would slow the checkout process (18 percent)

- employees would have trouble dealing with the system (8 percent)

- the EBT equipment would take up too much space (5 percent)

Most retailers seemed to feel that the switch from coupons to the EBT system would not affect them very much. They were asked a series of questions about whether they expected the EBT system to enhance or reduce overall profitability, total sales, food stamp sales, customer count, operating costs, and checkout counter productivity. Most respondents--65 percent to 80 percent--said that they expected no difference or that they were uncertain. Among those who expected the EBT system to make a difference, opinions were divided. Profitability and customer count were more often expected to improve than to decline, while the opposite was expected for checkout productivity and operating costs.

Early Responses to the EBT system

Once the EBT system began operating, the retailers generally expressed positive opinions. In interviews in October-December, 1984, 60 percent said that they preferred the EBT system to the coupon system. Less than half as many (25 percent) said that they preferred the coupon system, while 14 percent expressed no preference. Interviews in January-March, 1985, found even more favorable views: 72 percent preferred the EBT system, while 26 percent preferred coupons.

To a large degree, the reasons for the retailers' preferences mirrored their earlier expectations about the EBT system. Those who preferred the EBT system emphasized the overall ease of dealing with the system, particularly in not having to handle coupons. In response to a separate question, over half said that the EBT system was easier than the coupon system, while less than a quarter felt the EBT system was harder.

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The other common reasons for preferring the EBT system were the fact that no change is given for EBT purchases and the system's perceived ability to reduce fraud and abuse. On the latter point, 86 percent of the retailers said the EBT system was reducing fraud and abuse.

Most of the grocers who preferred the coupon system said that coupons were faster at the checkout counters. A variety of other problems were raised by one or two respondents, such as employee difficulties in learning the system, uncertainty about the schedule for food stamp deposits to the store account, and problems with telephone lines.

Even grocers who preferred the EBT system experienced problems with it. System slowdowns and downtime were most bothersome. Asked to name the EBT system's major drawbacks, about 30 percent of the retailers gave responses related to delays at the checkout counter. Another 10 percent said the manual system was too time-consuming and cumbersome. (Some grocers, attempting to avoid the manual system, reportedly used methods that contravened program regulations, such as holding recipients' EBT cards for later processing. The FNS regional office issued a "reminder" describing allowable procedures.) No other factor accounted for more than 5 percent of the responses.

Retailers reported other problems as well. Nearly half had experienced some problem with their BTTs or printers, though these were generally regarded as minor problems, quickly resolved. About a third of the grocers said they found it difficult to reconcile deposits against EBT sales, and nearly as many said that deposits had been received late or in the wrong amount.

Although grocers had anticipated problems with recipients using the EBT system, this failed to materialize as a major issue. More than half of the grocers said that their food stamp customers had no difficulties with the new system. Most of those who reported a problem said that a small percentage of recipients did not know their balance. However, no one who expressed a preference for coupons said it was because of recipient problems with the EBT system.

Most retailers had not expected the EBT system to have substantial effects on general profitability or productivity, and their early experience was consistent with expectations. Asked about a series of financial measures,

between 65 percent and 95 percent said that the EBT system had made no differ-ence. Those who did feel some effects of the EBT system most often reported negative impacts. This was especially true of productivity at the checkout counter: 10 percent thought that the EBT system had reduced checkout pro-ductivity, while only 3 percent said the system had enhanced productivity. Very few retailers felt any effect on overall profitability; 2 retailers felt that the EBT system had contributed to a decline, while 3 said the system had improved profitability.

It appears that the retailers' generally positive reaction to the EBT system rests mainly on the elimination of coupon handling and on factors that they saw as improving the effectiveness of the Food Stamp Program (e.g., not giving change from food stamp purchases and reducing abuse of the benefits). On other points grocers saw no particular benefits, but neither did they see problems that outweighed the system's attractive features.

7.5 RECIPIENTS' OBSERVATIONS ABOUT THE READING SYSTEM

Recipients' Expectations

Food stamp recipients were not initially as positive as the retailers in their attitude toward the EBT system. Still, they tended to have somewhat more positive than negative expectations, according to a survey conducted shortly before EBT implementation began.[1]

Most EBT recipients (80 percent) said they knew about the EBT system at the time of the survey (August and early September of 1984). This would be expected. The welfare office had already issued the new photo identification cards that subsequently would be encoded as benefit cards, and the purpose of the cards had been explained in general terms when issued. In addition, the demonstration had received considerable publicity and press coverage. The

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[1]The survey involved 286 interviews with a random sample of house-holds in the demonstration area who were issued food stamps in July 1984 (referred to as "EBT recipients"). A parallel survey was conducted at the same time of a comparison group of 285 recipients living in ZIP codes just outside the demonstration area (referred to as "non-EBT recipients"). The non-EBT group was a stratified random sample with oversampling of some sub-groups to obtain the same demographic profile as the EBT recipients.

survey of non-EBT recipients found that 63 percent of them also had heard of the new system.

More recipients expected the EBT system to be an improvement than a detriment to the Food Stamp Program. Among those who would actually be in the demonstration, 45 percent felt the EBT system would make the program better, while 21 percent held the opposite opinion. The remainder felt it would make no difference or had no opinion.

Non-EBT recipients, who had received no "official" explanation of the new system, expressed somewhat less favorable opinions, but were still more positive than negative. Of those non-EBT recipients who had heard of the EBT system, 33 percent thought it would make the program better, 24 percent thought it would make the program worse, and the remaining 43 percent thought it would make no difference or had no opinion.

Recipients who thought that the EBT system would improve the Food Stamp Program most often said the new system would curtail abuses such as the purchase of unauthorized items and sale of coupons for cash. While some people may perceive recipients as the perpetrators rather than the victims of such abuse, the survey results suggest that recipients themselves place a high value on the proper use of program benefits.

The other ways that recipients expected the EBT system to improve the Food Stamp Program generally concerned issues of security and convenience. Some felt that the EBT system would reduce the threat of coupon theft and accidental loss. Some valued the fact that they would no longer have to go to the bank to exchange ATPs for coupons, and generally felt that the EBT system would be faster and easier.

Recipients who felt that the EBT system would have negative effects most often said it would be confusing, with particular reference to keeping track of their benefits. A few recipients also felt that the electronic system would be less convenient or that grocery stores would object to it.

Despite their positive expectations about the EBT system as an element of the Food Stamp Program, EBT recipients expressed mixed opinions about its effect on their grocery shopping. About 24 percent felt that shopping would be easier with the EBT card, largely because they would not have to deal with the coupon books. An equal number felt that it would be harder, citing

confusion and the difficulty of keeping track of their benefit balance. The remaining 52 percent expected no difference or had no opinion.[1]

Early Experiences with the System

Recipients expressed quite positive opinions about the EBT system in interviews conducted in February-March 1985, shortly after the system began operations.[2] Households that had experience both with coupons and with the EBT system were asked which they preferred. A strong majority--74 percent-- preferred the EBT system. Only 21 percent preferred coupons, and 6 percent were undecided.

A major factor in recipients' preference for the EBT system was a perception that it was easier to deal with than the coupon system. Asked whether it was easier or harder to do food shopping with the EBT card, 55 percent percent said, "Easier," and only 13 percent said, "Harder." Among those who found the EBT system easier, 42 percent cited the convenience of paying with the EBT card as compared to coupon books. Other EBT features commonly mentioned were not having to go to the bank to transact ATPs (15 percent), better security (13 percent), faster checkout (12 percent), and not having to carry coupons around (10 percent).

Recipients who felt that shopping with the EBT system was harder than with coupons most commonly said that paying was slower with the EBT card (35 percent) or mentioned problems with the EBT system not accepting transactions quickly (25 percent). Relatively few people mentioned difficulty in keeping track of their account balance (8 percent) or general difficulty in understanding the system (6 percent).

Most recipients reported that they had not encountered problems in dealing with the EBT system, although a substantial number had been unable to use their EBT card at least once because of system problems. Exhibit 7.1

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[1]Non-EBT recipients expressed very similar opinions. About 20 percent felt shopping would be easier with the EBT system, and 22 percent felt it would be harder.

[2]The sample included persons who had been interviewed in the August-September period and additional households that had begun receiving food stamps in the interim.

lists the problems identified by the recipients. EBT equipment not working
and difficulty obtaining account balances were the most common problems.

Exhibit 7.1

PERCENTAGE OF RECIPIENTS REPORTING EBT-RELATED PROBLEMS

Problem   Percentage

Could not use card because checkout equipment not working...........36%

Could not find out how much was left in account.....................11%

Card damaged so it could not be used................................8%

Forgot PIN..7%

Account credited late...6%

Account credited for too little.....................................6%

Lost track of balance...4%

Card lost...4%

Card stolen...1%

Someone else in household used card without authorization...........1%

Grocery deducted more from account than amount of purchase..........1%

The responses to the survey questions cannot be considered strong measures of
the frequency with which these problems happen. They indicate, however, that
only system slowdowns and downtime made an impression on many recipients.
Even the system problems, common enough for most recipients to have encoun-
tered them, were mentioned by only about a third of the respondents. Appar-
ently the convenience of the EBT system far outweighed its difficulties in
most recipients' perceptions.

7.6 ISSUES OF CONTRACT SPECIFICATIONS AND MANAGEMENT

        Experience with the Reading demonstration suggests several areas of
EBT contract management needing special attention. As described below, two of
these areas deal with performance criteria and contract scheduling. The

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others involve the sponsoring agency's need for technical assistance and the need for close interaction with participating retailers.

The Need for System Performance Criteria

Although the solicitation for the Reading demonstration made quite explicit demands about the functional and special requirements for an EBT system, it did not specify many system performance criteria. In large part, lack of experience with point-of-sale funds transfer systems--and especially with EBT systems--meant that reasonable values for performance criteria were not known.

In the absence of performance criteria, however, it has been difficult for FNS to manage its contract with PRC. In particular, FNS has found it hard to make definitive and enforceable statements about whether the EBT system was operating at an acceptable level. For example, the system sometimes had slow response times. The slowdowns were clear, but it was unclear whether their frequency or extent was inconsistent with PRC's contractual responsibility.

The lack of specified performance criteria also has made PRC's contract management more difficult. Without explicit performance criteria, a system contractor faces the potential for changing expectations and ambiguity about the success or failure of the system.

These problems indicate that the sponsoring agency--if it uses an external contractor to develop and implement an EBT system--must establish at least a few key system performance criteria in the initial solicitation. Examples include requirements covering system response times and system reliability. Furthermore, these criteria should be defined from the viewpoint of system users rather than in terms of the system's internal functioning. For instance, the system's response time might be defined as the time between the retail clerk pressing the "Send" key and the printing of a receipt, rather than the transaction processing time recorded within the computer. Similarly, system reliability might be defined in terms of the percentage of transaction attempts that are successfully completed, rather than the traditional "up time" measure of the central processor's functioning.

A complete set of performance criteria for an EBT system should not be limited to the processing of normal purchase transactions. It should specify acceptable performance levels for benefit authorizations and card initializations, the crediting of retail accounts, the balancing of accounts, and the production of management and reconciliation reports.

In specifying performance criteria, the sponsoring agency should recognize that some factors affecting system performance may be outside the control of the system contractor. For example, levels of benefit usage may exceed reasonably established expectation. System response times depend in part on dialing and telephone transmission speeds, which can vary. The existence of such externally determined factors requires that the sponsoring agency exercise judgment when evaluating system performance relative to specified criteria. However, the system contractor should consider the potential impacts of these factors on system performance and--insofar as possible--account for these impacts during the system design process.

The Need for Expert Evaluation of the System

Establishing performance criteria reduces the agency's need to perform a detailed technical evaluation of a system's internal functioning. Nevertheless, it must be recognized that substantial technical expertise will be needed throughout the contract. This need is greatest when evaluating initial proposals, in the review of documents produced during the design and development phases, and in considering any proposed modifications to the system design. In addition, expert assistance may be needed during the development of the solicitation itself. In particular, assistance may be needed to establish performance criteria that fall within the realm of current point-of-sale and electronic funds transfer technologies.

It is important for technical evaluation of the system design to occur as early as possible. The further the contractor progresses in developing the detailed aspects of the design, the more difficult and costly--both in time and contract expenditures--it becomes to make changes in response to evaluation comments. During the Reading demonstration, FNS used both its own data processing staff and outside consultants to assist with the following

functions: developing the solicitation, reviewing proposals, reviewing documents produced by PRC, and evaluating PRC's proposals for responding to observed problems.

As the contract progresses, the qualifications needed in technical experts may change. For example, during the evaluation of initial proposals, the sponsoring agency may need persons having expertise in a broad range of point-of-sale technologies because the proposed systems may differ substantially. Once a proposal has been selected, however, technical assistance should be focused on the particular design selected. This means that experts selected for reviewing and evaluating the design and subsequent implementation of the system must have a thorough knowledge of that system's hardware and software.

The Need for Realistic Scheduling

The design and development phase of the EBT demonstration in Reading required somewhat more than 13 months to complete, as compared to the 12 months originally planned. Although such a delay is not extraordinary, some of the factors causing the delay should be considered in future efforts.

The demonstration contract called for PRC to produce a series of written products (e.g. a Detailed System Design), and stipulated that FNS would review each product and respond with comments within four weeks. FNS found, however, that four weeks were not always sufficient to review a report fully and to prepare comments. The schedule called for a number of reports at the same time, which exacerbated the problem. The large number of people who had to review the reports, however, created the biggest problem. For instance, in addition to staff within FNS's Division of Family Nutrition Programs, staff from USDA's Office of the Inspector General, the Office of the General Counsel, the Pennsylvania Department of Public Welfare, and the Berks County Assistance Office all reviewed each report. Gathering and evaluating each reviewer's comments prior to preparing a set of comments for PRC required more time than anticipated.

Perhaps more important than the time needed for reviews was the time needed to resolve issues that arose from the reviews. For instance, some issues raised at the Critical Design Review needed consultation with other USDA agencies or other institutions before they could be resolved. The Office of

the General Counsel had to rule on the acceptability of printing recipients' account balance information on the EBT receipt. The required interface for electronic funds transfers within the EBT system needed consultation and coordination with two Federal Reserve regions because the United States Treasury wanted a letter of credit established for the demonstration rather than allowing a non-federal agency (i.e. AB&T) to directly debit USDA's account for the Food Stamp Program. This resolution required the involvement of the New York Federal Reserve bank as well as the Philadelphia Federal Reserve bank.

All these issues took more time to resolve than was allocated in the original schedule, and they caused some development activity to be delayed. The contract envisioned a clear demarcation between Phase I (design) and Phase II (development), with FNS giving formal approval to the design before proceeding with any Phase II activity. However, in order to minimize the delay, FNS authorized PRC to proceed with specific Phase II tasks before giving overall authorization for that phase.

Similar experiences occurred after the evaluations of the Functional Demonstration Test (at the end of Phase II) and the System Acceptance Test (at the beginning of Phase III). Each test raised issues that needed to be resolved before further contract tasks could be authorized. (See Chapter 3 for discussions of these issues.) Again, resolving these issues required more time than had been allocated in the original contract schedule.

Several suggestions have been made for avoiding schedule delays such as those experienced in Reading. In general, these suggestions imply that more time needs to be allowed for document review, test evaluation, and problem resolution. Planners should assume that some difficult issues will arise during system design and development, and that coordination among multiple actors will be necessary to resolve them.

Alternatively, more time could be scheduled prior to delivery of design documents. This would enable the system contractor to become more familiar with local food stamp operations, thereby making the design more responsive to the details of existing food stamp procedures. A more responsive design should reduce the number of difficult issues that arise during design review and system tests. Although this latter approach would not necessarily

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reduce the total time needed for the contract, it might reduce later disruptions to the scheduling of contract tasks.

With regard to contract tasks, a related scheduling issue is the long lead time required for some development activities, particularly for obtaining specialized computers and related equipment. For instance, PRC encountered delivery schedules of up to three to four months for store terminals, and up to two months for the system's computers. Presumably, the contractor should account for these delivery schedules in the original proposal. However, it is important to structure the contract schedule in such a way that, to the extent possible, development activities are not delayed by the need to resolve design issues.

The Need for Close Interaction with Retailers

The system contractor needs to contact retailers early in the system's design phase to determine their special needs with respect to an EBT system. In addition to this early communication, however, both the system contractor and the sponsoring agency need to maintain close interaction with retailers throughout the contract. The Reading experience suggests that this need is particularly acute during training and system operations.

As discussed in Chapter 3, PRC encountered some difficulty in getting retailers to send all their clerks to training sessions, presumably because they did not want to incur additional labor costs for their employees. Instead, store managers and selected clerks went to PRC's training. They then trained their remaining clerks themselves. This in-store training often was not as thorough as the original training, and this may have caused some of the equipment use problems encountered after operations began.

To avoid such problems, retailers need to be encouraged to send as many clerks as possible to regular training sessions. In addition, the sponsoring agency and system contractor should recognize that training sessions probably need to be scheduled on an on-going basis. Some clerks will need to be retrained, and normal turnover among retail employees will supply a constant pool of clerks without formal training. New stores entering the system also will have employees needing training.

The Reading demonstration also suggests that problems with store equipment are likely to arise during system operations. Because not all potential problems can be foreseen and addressed during training, the contractor should establish procedures for contacting retailers and advising them how to handle frequently recurring problems. If any problems lead to changes in system design or operating procedures, retailers must be notified of any changes affecting their responsibilities. Retraining may be necessary when making major changes.

Finally, during the course of system operations, retailers may modify system procedures to fit their special needs. These modifications may violate program regulations or cause problems with other system functions. In Reading, for example, some retailers circumvented the $35 limit on manual sales by requesting multiple authorizations over a period of several days to cover a single large sale. This violates program regulations prohibiting the extension of credit for food stamp purchases. Similarly, some retailers asked recipients to leave their EBT cards with them when sales could not be processed by the system. Recipients took their purchased groceries, then returned at a later date to process the sale and pick up their cards.

To identify such incidents of system abuse, the contractor or the sponsoring agency must monitor store operations to ensure that stores follow all procedures correctly. It may be necessary to send notices to retailers reminding them of proper operating procedures. Of course, the monitoring also serves to identify areas of system operations with which retailers have difficulty. This information may help in modifying system operations to better meet the needs of retailers.

7.7 A CHECKLIST OF PROCEDURAL CONSIDERATIONS FOR SYSTEM DEVELOPERS

Previous chapters described the major elements of an EBT system design and the phases of activity needed to implement a system. An agency contemplating development of an EBT system will necessarily focus much of its attention on these issues.

The Reading experience indicates that successful implementation of an EBT system will depend on a number of procedural issues as well as on design features. This section offers a list of these issues in question form. The questions are intended as reminders: they concern points which might be

overlooked, but which can make an important difference in the development and implementation process.

The list is organized by the major groups participating in the system: recipients, retailers, the state welfare agency, the local welfare office(s), financial institutions, system operators, and the sponsoring agency.

Recipients

- What procedures should be followed for contacting recipients or recipient advocacy groups to gain input for system design?

- Once a geographic area to be served by the system is selected, which food stamp recipients should be included in the system? Should any subgroups be excluded?

- Prior to system implementation, what procedures should be followed for informing recipients about the impending changes in program operations?

- Given the proposed design for the system, what are the potential difficulties recipients will have using the system? How can these difficulties be minimized?

- What special training needs will recipients have? In particular, what are the special needs of elderly and non-English-speaking recipients, and recipients with physical, mental, or emotional handicaps?

- What are the logistics of training recipients to use the system? Who will conduct the training? When and where will training sessions be held? How many recipients will be trained during each session, and how many sessions will be required? What training facilities and materials will be required? Finally, what follow-up efforts will be pursued to train recipients who fail to appear for training?

- How will the system accommodate recipients' established shopping patterns? This includes where they shop, when they shop, and who does the shopping.

- How will the system meet the needs of recipients confined to their homes or institutionalized?

- How will the system respond to the needs of recipients moving out of the area served by the system? What about recipients who wish to shop outside the area for brief periods?

- How are Food Stamp Program regulations to be met with respect to notifying recipients about changes in operations, about training requirements, and about adverse case actions if recipients do not appear for training?

Retailers

- What procedures should be followed for contacting retailers to gain input for system design?

- Given the geographic location of recipients to be served by the system, which retailers should be allowed to participate in the system?

- To what extent will retailers share the costs of participating in a Food Stamp Program or integrated EBT system?

- What procedures will be followed to enroll retailers in the system? Are these procedures responsive to retailers' needs for quick entry onto the system after system implementation?

- What procedures are needed to remove retailers from the system when they either go out of business, lose authorization to participate in the Food Stamp Program, or decide to drop out of the system?

- Given the proposed design for the system, what potential difficulties will retailers have using the system? In particular, what are the proposed procedures for manual backup and for retailer reconciliation of food stamp sales and deposits?

- How will mobile vendors process food stamp sales?

- What are the training needs of retailers? What are the logistics for training retailers? What procedures will be available for ongoing training? Can procedures be developed which enable store managers or their assistants to perform in-store training?

- Prior to system implementation, what procedures should be followed for informing retailers about the impending changes in program operations?

- What arrangements will be followed for monitoring store operations, for identifying equipment problems, and for servicing EBT equipment?

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- How many checkout counters in each store must be capable of processing EBT sales?

- What procedures will be followed for informing retailers of issuance dates and changes in system operations?

State Welfare Agency

- What procedures will be followed for contacting agency personnel to gain input for system design?

- How will the system interact with other Food Stamp Program operations? What existing operations will have to be modified?

- What data must the EBT system provide to meet the agency's regular management and oversight functions? What are the reconciliation requirements of the agency?

- What changes or waivers to state regulations will be needed to implement an EBT system?

- What procedures will be followed for ongoing communication with the agency about system operations, problems, and changes?

- What impacts will the system have on agency responsibilities and workload?

Local Welfare Office

- What procedures will be followed for contacting welfare office personnel to gain input for system design?

- How will the system interact with other Food Stamp Program operations? What existing operations will have to be modified?

- What procedures will be followed for ongoing communication with the office about system operations, problems, and changes?

- What are the training requirements for office personnel? What are the logistics for training office personnel?

- How will the system affect office responsibilities and workload?

Financial Institutions

- Which financial institution will receive information on retailer credits for entry into the electronic funds transfer (EFT) network?

- What are the information content and format requirements for the EFT network?

- What are the processing deadlines for the EFT network?

- How will the system affect the responsibilities and workload at financial institutions?

- How will local bank(s) interface with the Federal Reserve System and obtain USDA funds to cover retailer deposits?

- What financial arrangements are needed with financial institutions? What service fees will financial institutions charge to the retailers or to the state agency for processing EBT transactions?

System Operators

- What are the staffing requirements for operating the EBT system? How many personnel and what qualifications are needed?

- Who will have responsibility for managing and supervising EBT operations?

- What are the training needs of system operators? What procedures minimize the incidence of operator error?

- What procedures will be followed to ensure timely response to system problems, both in the field and at the operations center?

Sponsoring Agency

- What functional and special requirements should be specified for system design? Should the agency specify particular design elements as well?

- What performance criteria should be specified for system operations?

- What changes or waivers to Food Stamp Program regulations will be required to implement the system?

- What is a realistic schedule for designing, developing, and implementing the system? Does the schedule allow for lead times on equipment orders? Does it allow adequate time for resolving problems that arise at review and test points?

- What level of outside expert assistance will be required to develop the solicitation for the system, to review bids, to review system design, and to evaluate the final system and any proposals submitted to correct system problems? What qualifications must outside experts have to perform these functions?

- What management reports will be needed to ensure the system's compliance with functional requirements and performance criteria?

- What procedures should be implemented to monitor system operations?

APPENDIX A

GLOSSARY

Appendix A

GLOSSARY

AB&T	American Bank and Trust Company. Reading bank which receives retailer deposit information and initiates funds transfer requests for the EBT system through the Federal Reserve system.
ACH	Automated Clearing House. Financial network used to process funds transfer requests.
ADP	Automated Data Processing.
ATP	Authorization-to-Participate Card. Card used in some jurisdictions to authorize delivery of food stamp coupons to program recipients.
BCAO	Berks County Assistance Office. The local welfare office serving the Reading area.
BIC	Benefit Identification Card. Photo identification card with encoded magnetic stripe used to access benefits in the EBT system.
BTT	Benefit Transaction Terminal. Equipment located at retail checkout counters to read recipients' BICs and to transmit transaction information to the EBT Center. Also referred to as Benefit Transfer Terminal.
EBT	Electronic Benefit Transfer. The EBT system uses electronic funds transfer and point-of-sale technologies for the delivery and control of food stamp benefits.
EBT Center	Local operations center for the Reading EBT system.
EFT	Electronic Funds Transfer.
FNS	Food and Nutrition Service. Federal agency within USDA responsible for administering the Food Stamp Program.
MARO	Mid-Atlantic Regional Office. Regional office of FNS serving the Reading area.
NACHA	National Automated Clearing House Association. All electronic funds transfer requests need to be transmitted in a standard format adopted by this association.
OGC	Office of the General Counsel of the United States Department of Agriculture.
OIG	Office of the Inspector General of the United States Department of Agriculture.

PDPW   Pennsylvania Department of Public Welfare. State agency
                 responsible for administering Food Stamp Program operations.

PIN   Personal Identification Number. A four-digit code selected by
                 the recipient. This code must be entered on the PIN-pad
                 attached to the BTT before any purchase transaction will be
                 processed in the EBT system. Also required for balance
                 inquiries.

PIN offset   A special number that is based on the recipient's BIC number
                 and PIN.

POS   Point-of-Sale. Refers to equipment and systems that debit
                 clients' accounts and credit retailers' accounts as a sale is
                 performed.

PRC   Planning Research Corporation. Contractor selected to design,
                 develop, and implement the Reading EBT system.

TAC   Transaction Authorization Code. A number computed and trans-
                 mitted by a store BTT for each electronic purchase and refund
                 transaction. The number is based on the data being trans-
                 mitted. The system's computers, upon receipt of transaction
                 data, recompute the TAC. If the transmitted data have been
                 degraded during transmission, the two TACs will not match and
                 the transmitted data will not be processed.

USDA   United States Department of Agriculture.

VIO unit   Voice Input/Output unit. This unit is attached to the EBT
                 system's computer and provides balance information in a syn-
                 thesized voice when recipients call a special telephone number
                 using a telephone with touch-tone service.

APPENDIX B

CHRONOLOGY OF DEMONSTRATION EVENTS

Appendix B

CHRONOLOGY OF DEMONSTRATION EVENTS

1982

June 17	Official notice of solicitation published in Commerce Business Daily.
September 3	Draft RFP issued. Comments and questions due no later than October 18.

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January 10	Final RFP issued. Proposals due February 25.
January 24	Preproposal conference held by FNS.
February 4	RFP modified. Proposal deadline extended to March 8.
March 8	Deadline for submission of proposals.
July 1	Contract awarded to Planning Research Corporation (PRC) of McLean, Virginia.
July 7	Kick-off meeting held between PRC and FNS.
July 8	General Notice of EBT Alternative Issuance Demonstration Project published in Federal Register.
July 26	PRC held initial briefing for the BCAO.
August 3	PRC held initial briefing for the PDPW.
August 8	PRC mailing to food retailers in four ZIP codes, notifying them of project.
August 11	MARO mailing to food retailers in four ZIP codes, notifying them of project.
August 15	Public notice of demonstration in local newspaper.
August 24, 30	PRC held initial briefings for Reading area food retailers.
September 12	Initial draft of Detailed System Design delivered to FNS.
September 14	PRC conducted briefing for BCAO Supervisory Board.
September 19	Letter submitted to FNS by PRC detailing information on necessary federal waivers for the demonstration.

September 22-23   PRC conducted briefings and presentations for financial institutions in Reading and local community organizations.

September 23   Initial drafts of Acceptance Test Plan, users' manuals, and training manuals delivered to FNS.

September 30   Initial draft of Implementation Plan delivered to FNS.

October 5   Meeting held with PRC, FNS, AB&T, and United States Treasury to discuss process for electronic funds transfer for the demonstration.

October 20   Critical Design Review held.

October 26   Meeting held with Third District Federal Reserve Bank in Philadelphia to discuss process for electronic funds transfer for the demonstration.

October 28   Revised Detailed System Design document submitted to FNS.

November 21   FNS authorized PRC to begin training programmers in PL/1 and to begin developing programming specifications. Although these were Phase II activities, early authorization was provided to reduce schedule delays.

December 2   FNS authorized PRC to begin developing software for system components according to baseline system design and to order one IBM Series/1 computer. Although these were Phase II activities, early authorization was provided to reduce schedule delays.

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January 24   PRC authorized to begin Phase II (System Development).

February 13   Publicity package sent out to local media to coincide with official announcement of extended demonstration boundaries.

February 16   Enrollment packets sent to 61 stores within five-mile radius of downtown Reading.

February 17   Official demonstration boundaries announced.

March-April   PRC completed store-by-store inspections to determine EBT equipment and telephone line needs.

April 3   Procedures finalized with AB&T and USDA for handling EBT credits and debits.

April 4   BCAO began issuing photo identification cards to recipients within demonstration boundaries.

May 13	Revised PRC deliverables submitted to FNS.
July 17	PRC asked AB&T to provide EBT Center backup when Center not staffed at night.
July 20-25	Functional Demonstration Test held.
August 6	Correction to problem with system's acceptance of transposed PIN digits demonstrated.
August 8	Successful electronic transmission between Harrisburg (PDPW) and PRC demonstrated.
August 9	PRC authorized to begin Phase III (System Implementation).
August 21	Amended General Notice of the EBT Alternative Issuance Demonstration Project published in Federal Register. This notice provided operational details about the demonstration which were unavailable at the time of the July 8, 1983, General Notice.
August 27-29	System Acceptance Test held.
September 11-17	PRC trained about 800 retail clerks and managers in use of the system.
September 19	PRC trained 35 PDPW employees in how to instruct recipients.
September 24-26	PRC trained about 110 BCAO employees in use of the system.
September 26	PRC trained 20 USDA "facilitators" for system start-up.
September 27	PRC trained about 15 retail clerks and managers during make-up session.
September 28	PRC trained community agency volunteers in use of the system.
October 1	System start-up. EBT Center updated Master File with October regular issuances.
October 1-5	USDA facilitators visited each store in the demonstration, answered questions, and assisted when problems arose.
October 1-12	PDPW and BCAO staff trained first wave of 1,630 food stamp recipients in use of system. Photo IDs encoded.
October 19	Make-up sessions held for October training; 44 recipients trained.

October 31   EBT Center updated Master File with November regular
                    issuances.

November 1-9   PDPW and BCAO staff trained second wave of 890 food stamp
                    recipients in use of system. Photo IDs encoded.

November 16   Make-up sessions held for November training; 62
                    recipients trained.

December 2   EBT Center updated Master File with December regular
                    issuances.

1985

January 1   EBT Center updated Master File with January regular
                    issuances.

January 2   MARO letter to retailers clarifying Food Stamp Program
                    policy regarding dollar limit for manual transactions and
                    extension of credit for food stamp purchases.

January 3-11   PDPW and BCAO staff trained third and final wave of 908
                    food stamp recipients in use of the system. Photo IDs
                    encoded.

January 23,24   Make-up sessions held for January training; 98 recipients
                    trained.

January 25   FNS authorized PRC to operate EBT Center 24 hours each
                    day.